Valley County

Accident Study and Improvement Plan

FEBRUARY 1984

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VALLEY COUNTY ACCIDENT STUDY

AND IMPROVEMENT PLAN

Prepared For:

MONTANA ASSOCIATION OF COUNTIES

In Cooperation With

MONTANA DEPARTMENT OF JUSTICE,
HIGHWAY TRAFFIC SAFETY DIVISION

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

A. Purpose

The purpose of this report is to analyze the cause of accidents at locations on the county road system where accident reports indicate a cluster of accidents, and to develop an improvement plan for those locations.

B. County Road Accident History

The Valley County road system has 2,118 miles of road, of which 2,018 miles are dirt or gravel surfaced and 100 miles are paved. The average road mileage for the 56 counties in the state is 1,219 miles with an average of 1,105 miles per county dirt or gravel surfaced and 114 miles paved.

During the four-year period from January 1979 through December 1982, 138 reported accidents occurred on the Valley County road system.

Accident rates are normally expressed in terms of number of vehicle miles traveled, generally the rate indicates the number of accidents per million vehicle miles of travel over a particular roadway. Sufficient traffic counts are not available on the county road system to estimate vehicle miles of travel, however, a comparison has been made of the number of accidents per capita and the number of accidents per mile of road. Compared to other counties in the state, Valley County ranks 38th in accidents per capita based on the 1980 county population and 37th in accidents per mile of county road.

Table 1 shows the total annual accidents on the county road system and the annual number of accidents on county roads statewide.

TABLE 1

VALLEY COUNTY VS. MONTANA COUNTY ROAD SYSTEM ACCIDENT COMPARISON, 1979-1982

	County	Percent of State	Montana
Population	10,250	1.3%	786,690
County Road Mileage	2,118	3.1%	68,240
Total Accidents on County Roads	138	1.1%	12,466
Annual Property Damage and Injury Accidents			
1979	36	1.1%	3,374
1980	28	0.9%	3,129
1981	36	1.2%	3,085
1982	34	1.2%	2,740
Total	134	1.1%	12,328
Fatal Accidents, 1979-1982	4	2.9%	138
Accidents Per Capita	.013	*	.016
Accidents Per Road Mile	.065	*	.183

* Not Applicable

TABLE 2

COMPARISON OF VALLEY COUNTY ACCIDENTS TO
ADJACENT COUNTIES, 1979-1982

	Statewide Rank	
County	Accidents/Capita	Accidents/Road Mile
VALLEY	38th	37th
Phillips	32nd	48th
Garfield	43rd	55th
McCone	27th	52nd
Roosevelt	52nd	40th
Daniels	50th	51st

Table 2 shows a comparison of accidents per capita and accidents per mile of county road for Valley County and the adjacent counties.

Valley County has 74 percent more county road mileage than the average county in the state. The number of accidents per person residing in the county is slightly less than the state average. Due to the extensive county road system, traffic on Valley County roads is probably significantly less than the state average. This also results in a much lower number of accidents per road mile. Valley County ranks about midway between the rankings of five adjacent counties in accidents per capita and accidents per road mile.

C. County Accident Locations

The Department of Justice maintains computer records of all reported accidents in the state. These are plotted on county maps, annually. The Highway Traffic Safety Division of the Department of Justice has carried out a number of projects where improvements were recommended at locations showing a concentration of accidents. The short-term improvements have been found to be effective in reducing accidents at specific locations. In 1979, Gallatin County implemented recommended short-term improvements at 19 high accident locations. The result was a reduction from an average of 16 accidents per year in 1979 to an average of six accidents at each site in 1980. The total cost of the engineering analysis and improvements was $22,000. Based on an average estimated cost of $6,800 per accident and a five-year life for the improvements, the resulting users savings was $15 for every $1 of safety improvement funds expended.

Six locations in Valley County were found to have clusters of accidents that would warrant a detailed investigation. The sites selected are described below.

Site Number	Location
1	Intersection of 2nd Avenue North and Montana, Ohio and Minnesota Streets in Hinsdale
2	Skylark Road -- Intersection of Landfill Road
3	Skylark Road, South of Golf Course
4	Mahan and Hoyt Reservoir Road and Brazil Creek Road
5	6th Avenue Bridge -- Glasgow
6	Cottage Road -- Fort Peck

Chapter III summarizes the short range improvements and priority for each site. Chapter IV shows the detailed analysis of each site.

The locations are shown on the Site Location Map at the beginning of Chapter IV.

CHAPTER II

STUDY METHODS

The determination of improvements required to reduce accidents at the selected sites involves eight basic steps. These are outlined in the following sections.

A. Accident Analysis

Department of Justice microfilm records were used to obtain the accident reports of accidents at each of the selected sites. The accident reports were reviewed and pertinent information was plotted on a preliminary sketch of each location. This information included: a symbolic sketch showing vehicle paths, point of collision, collision type, time of day, road condition and number of injuries or fatalities. The sketches were used to determine trends and patterns.

B. Preliminary Field Survey

The Highway Traffic Safety Division, Traffic Engineer, and the consultant visited each site to determine the specific area to be covered by the detailed field survey. The Valley County road superintendent was also contacted and the characteristics of each site including planning improvements were reviewed. Each site was photographed and general characteristics were noted.

C. Detailed Field Survey

A two-man survey crew revisited each site to collect detailed data. The following information was collected;

1. Site Survey -- Each site was surveyed so that an accurate plan of the site could be prepared, showing roadway alignment, grades, superelevations and other physical characteristics. Surrounding topography was also surveyed showing sign and

other traffic control device locations, fences, utility poles, trees and other roadside objects. The survey was extended to take in all features which could have an effect on the road-user such as background roads that appear to be an extension of the roadway or utility lines or waterways which continue straight while the roadway turns. These features sometimes create driver expectancy resulting in off-road accidents.

2. Traffic Counts -- All available count data for each site was obtained from the Montana Department of Highways. In locations where counts were not available, peak hour counts were made and were used to estimate average daily traffic. Some sites are subject to extreme seasonal traffic variations. At these sites, housing counts along with other land uses were used to estimate average daily traffic.[1]

3. Sight Distance -- The driver sight distance on all approaches at each site was measured.

4. Safe Speed Study -- A ball-bank indicator was used to determine the safe speed on horizontal curves. This instrument measures the overturning force on a vehicle and limits at which riding discomfort and loss of vehicle control begin.

5. Driver Expectancy and Information System Evaluation -- Each member of the survey crew independently rated the driver expectancy and informational system of each site.

   The driver expectancy rating is a measure of a driver's perception of the roadway and the amount of time a driver has to react and take the necessary actions to pass safely through the location. The rating ranges from no unexpected or unusual actions required to very unusual situations which would surprise many unfamiliar drivers.

   The information system evaluation consisted of determining if the roadway and traffic control devices were sufficient to give the driver the information required in sufficient time to take the necessary actions to safely negotiate the location. Ratings for the information system range from easy and obvious information interpretation to the lack of important information.

   The evaluation forms used for the driver expectancy and information system evaluation are shown in Figures 1 and 2.

---

[1] ADT

FIGURE 1

DRIVER EXPECTANCY PROBLEMS RATING FORM

Ratings

0 -- Nothing expected or unusual at this location.
Actions required (if any) entirely consistent with driving strategy on approach.
Standard geometry, with pathway(s) for intended movement(s) clearly evident.
No interferences by other traffic likely.

1 --

2 --

3 -- Situation somewhat unexpected.
Driver must be alert, but should be able to respond adequately at "last minute" to most combinations or adverse circumstances.
Some initial confusion on intended path(s) or movements(s).
Interference from other traffic may create some degree of confusion or uncertainty for average driver.

4 --

5 --

6 -- Very unusual situation; will "surprise" many unfamiliar drivers.
Driver required to make major change in driving tactics from those employed over past few miles.
At least a "near accident" almost expected if driver is even moderately inattentive; evasive actions likely to be required.
Intended pathway(s) confusing under fairly normal traffic or lighting conditions.
Other traffic, or lack of it, aggravates situation and misleads driver or deprives him of important cues.

Approach

	Rating						
	0	1	2	3	4	5	6
A	x	x	x	x	x	x	x
B	x	x	x	x	x	x	x
C	x	x	x	x	x	x	x
D	x	x	x	x	x	x	x

Source: Identification of Hazardous Locations, Report No. FHWA-RD-77-83

FIGURE 2

INFORMATION SYSTEM DEFICIENCIES RATING FORM

Ratings

0 -- Information for required decisions complete and ambiguous.
Signs, markings, delineation in good repair, clean, highly visible.
"Positive guidance" leads driver to appropriate path; makes error difficult.
Approach speeds of most drivers are appropriate.
Light decision load; easy, and obvious.

1 --

2 --

3 -- Some information lacking or somewhat misleading.
Signs should be moved or augmented for better visibility or to provide more decision time.
Visibility of signs, markings, and delineation barely adequate.
Advisory speed information should be changed slightly, or added.
Medium decision load; average driver will be able to handle situation, but may be a little uncomfortable.

4 --

5 --

6 -- Important information missing.
Complete new "information system" needed -- design and installation.
Present signs and markings in very poor condition; need replacement.
Speed limit and/or advisory speed needed; either missing or totally inappropriate at present.
"Positive guidance" on appropriate path lacking; a clutter of negative delineation only.
Heavy decision load; complete attention of average driver required; a "tense" situation at best.

Approach

	Rating						
	0	1	2	3	4	5	6
A	x	x	x	x	x	x	x
B	x	x	x	x	x	x	x
C	x	x	x	x	x	x	x
D	x	x	x	x	x	x	x

Source: Identification of Hazardous Locations, Report No. FHWA-RD-77-83

6. Site Sketches -- The field survey data was used to prepare a sketch of each site showing the pertinent features. These include alignment, grade, roadway dimensions, approaches, ditches, foliage, roadside objects, traffic control devices, surface type and condition, sight distance and surrounding features that may affect the function of the roadway. The sketches have been used as a base to show the existing conditions, accident diagrams and recommended improvements contained in the site analysis section of this report (Chapter IV).

D. Calculate Hazard Index

A hazard index was calculated for each site. The hazard index calculations form along with the various indicator values are shown in Figures 3 through 10. The factors entering into the hazard index calculation are as follows:

- Number of Accidents -- The average annual number of accidents for the four-year period from 1979 through 1982 was used to calculate this indicator (see Figure 3).

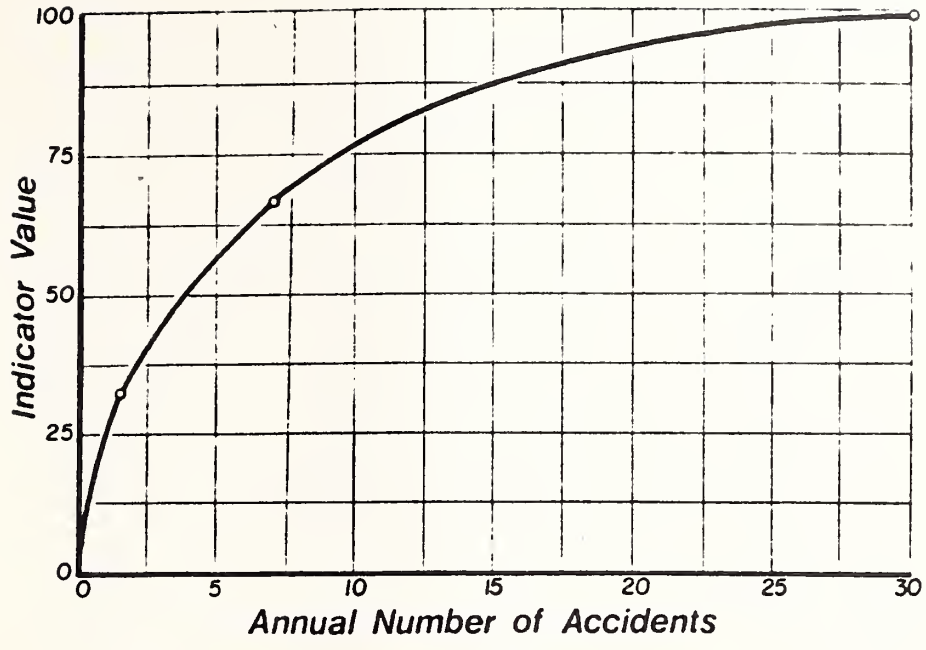
- Accident Rate -- The accident rate is expressed in accidents per million vehicle miles of travel. The average daily traffic (ADT) as determined from Montana Department of Highways traffic counts, and estimated ADT based on peak hour counts or land use, were used to compute this indicator (see Figure 4).

- Accident Severity -- Accident severity relates property damages, bodily injuries and fatalities to dollar costs. The unit costs shown in Figure 4 were used to calculate this indicator (see Figure 5).

- Volume/Capacity Ratio -- The 1983 average daily traffic and the 24-hour capacity (Level of Service) as calculated using the methods set forth in the 1965 Highway Capacity Manual, were used to calculate this indicator (see Figure 6).

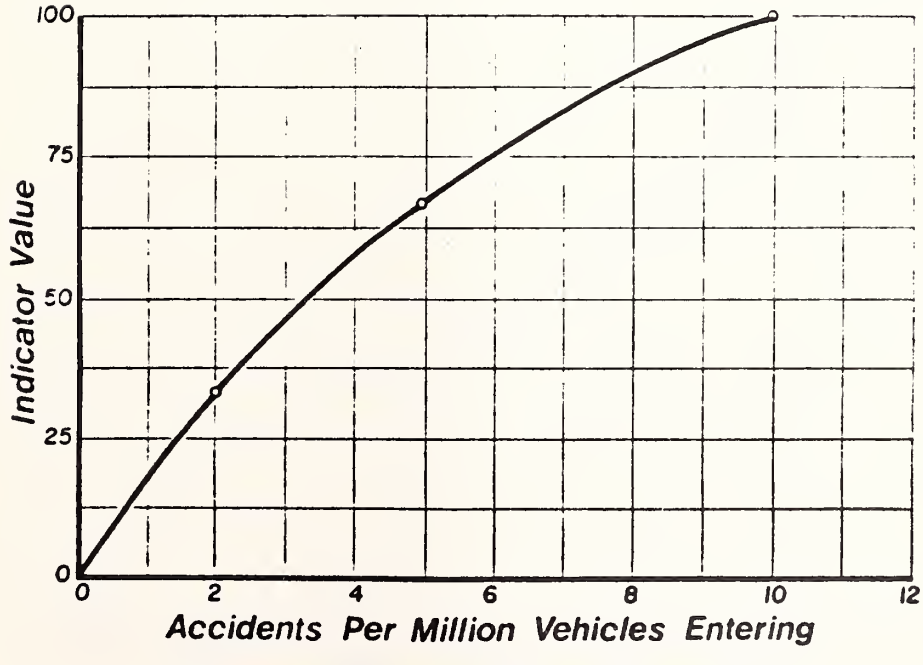
- Sight Distance -- Sight distances on all approaches were determined by the field survey. This was related to the required stopping distance to determine the indicator value of each location (see Figure 7).

- Driver Expectancy Problems and Information System Deficiencies -- The average rating values from the two independent field ratings were used to determine the values for these two indicators (see Figures 1, 2, 8, and 9).



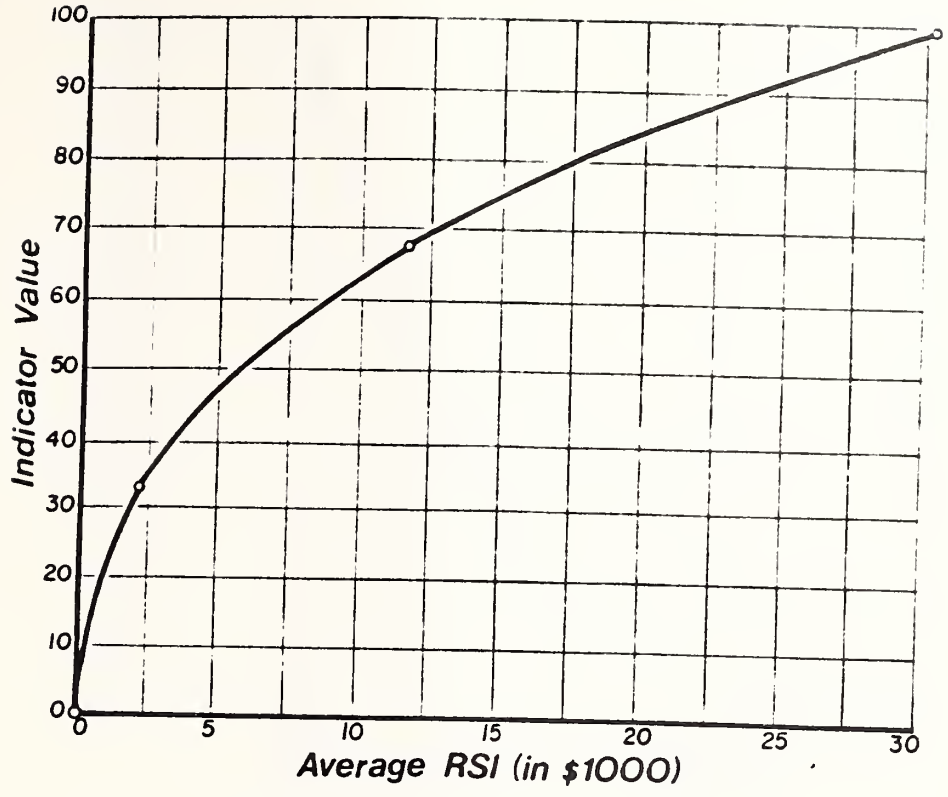
INDICATOR VALUES FOR NUMBER OF ACCIDENTS

Figure 3



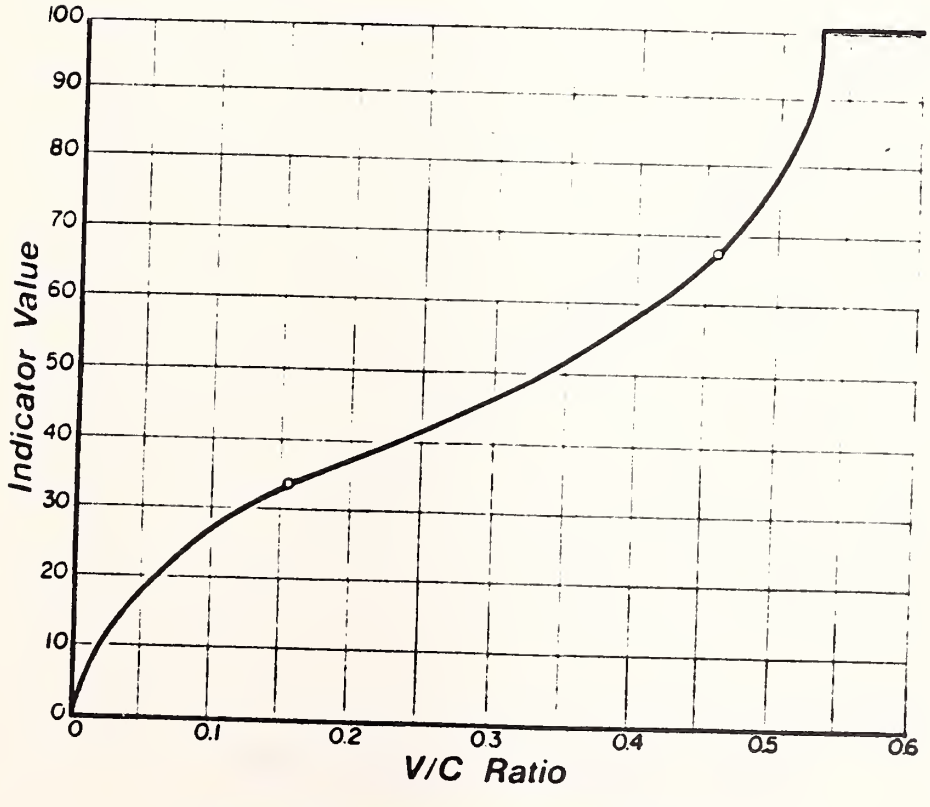
INDICATOR VALUES FOR ACCIDENT RATE

Figure 4



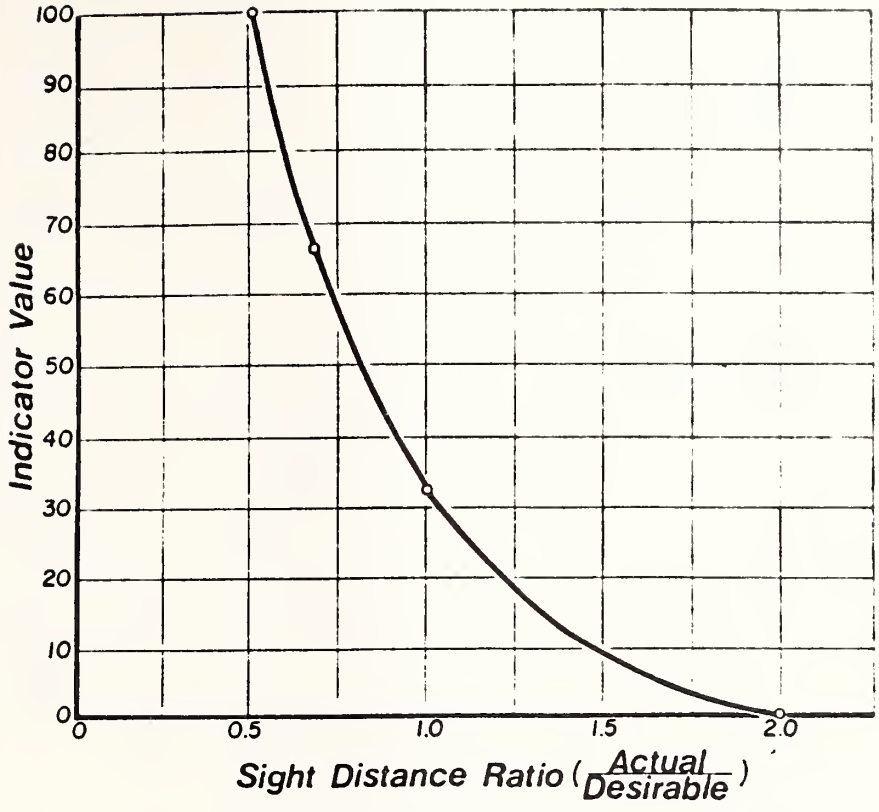
INDICATOR VALUE FOR
ACCIDENT SEVERITY

Figure 5



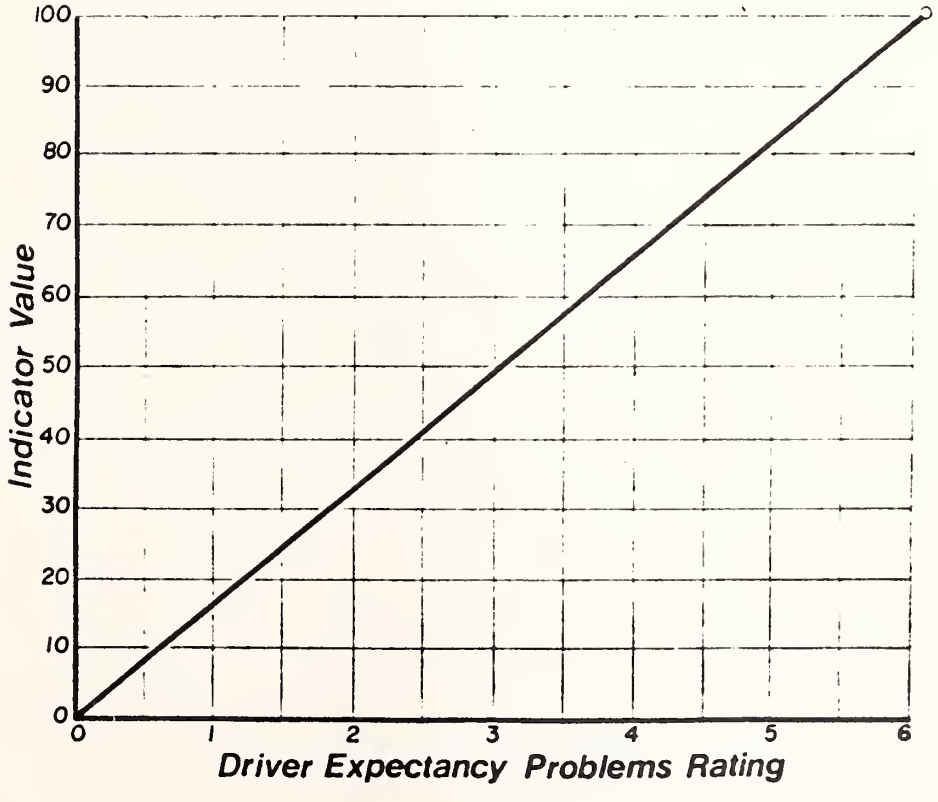
INDICATOR VALUES FOR
V/C RATIO

Figure 6



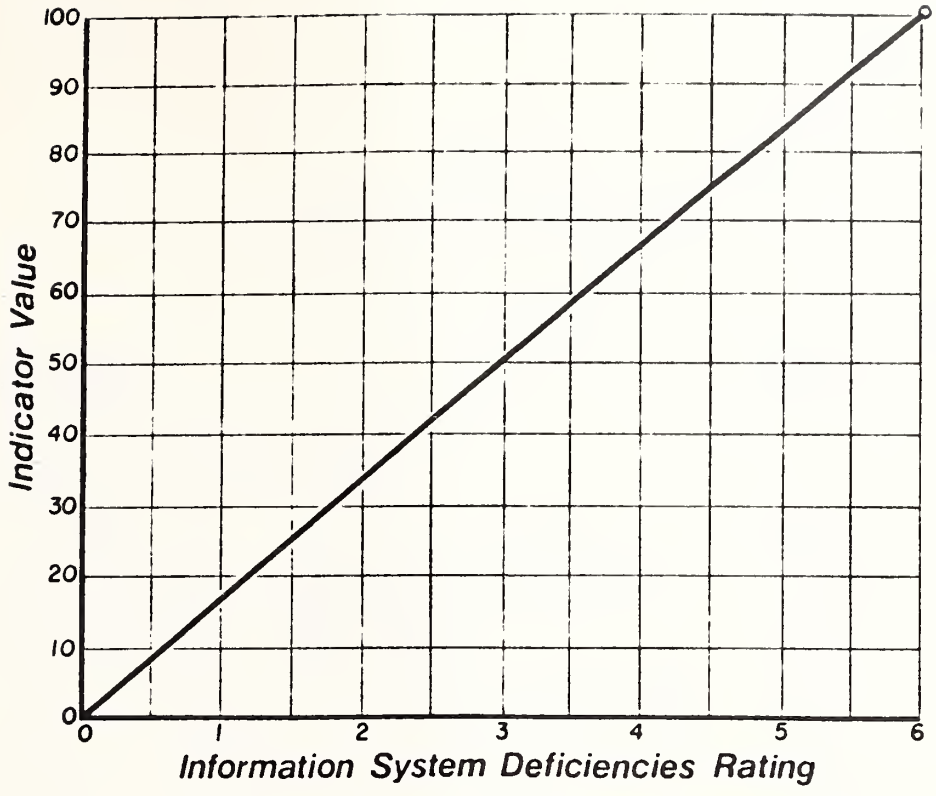
INDICATOR VALUES FOR SIGHT DISTANCE

Figure 7



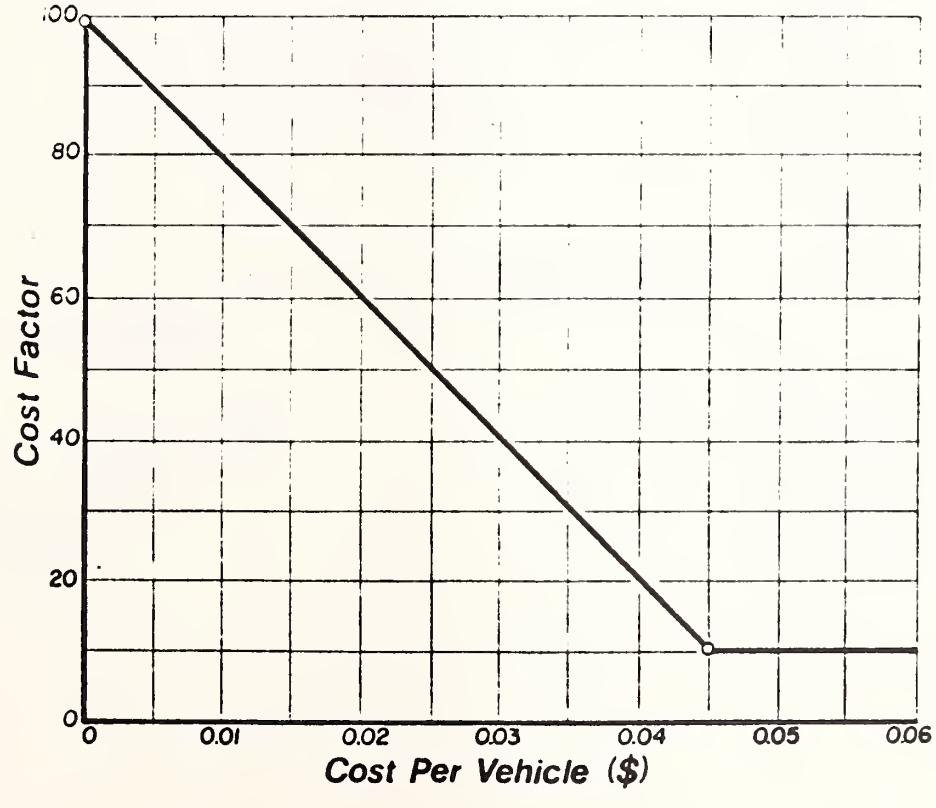
INDICATOR VALUES FOR DRIVER EXPECTANCY

Figure 8



INDICATOR VALUES FOR INFORMATION SYSTEM DEFICIENCIES

Figure 9



FORM FOR DETERMINATION OF COST FACTOR

Figure 10

TABLE 3

RELATIVE SEVERITY INDEX

TYPE OF ACCIDENT	RSI Urban	RSI Rural
Multi-Vehicle, At Intersection		
Enter at angle	$ 4,300	$14,400
From same direction - both going straight	2,800	5,100
From same direction - one turn, one straight	2,500	5,100
From same direction - one stopped	3,800	5,200
From same direction - all others	2,000	6,300
From opposite direction - both going straight	4,400	20,000
From opposite direction - one left turn, one straight	4,400	15,400
From opposite directions - all others	2,700	3,800
Not stated	3,800	5,200
Multi-Vehicle, Non-Intersection		
Going opposite direction - both moving	$ 4,400	$19,600
Going same direction - both moving	2,900	8,100
One car parked	1,600	2,400
One car stopped in traffic	4,200	6,800
One car entering parked position	1,900	2,300
One car leaving parked position	1,200	2,700
One car entering alley or driveway	3,400	6,000
One car leaving alley or driveway	2,000	4,400
All others	1,700	7,600
Not stated	3,400	6,000
Motor Vehicle with Pedestrian, At Intersection and Non-Intersection		
Vehicle going straight	$20,000	$49,000
Vehicle turning right	13,600	11,200
Vehicle turning left	17,100	11,200
Vehicle backing	20,600	11,200
All others	14,500	11,200
Not stated	11,200	11,200

TABLE 3

RELATIVE SEVERITY INDEX (Continued)

TYPE OF ACCIDENT	RSI Urban	RSI Rural
Single Vehicle, at Intersection		
Collision with train	$26,700	$39,100
Collision with bicycle	13,100	31,900
Injury in vehicle, jacknifed	5,200	2,000
Collision with fixed object in road	5,500	7,000
Overturned in road	9,200	7,500
Left road	5,200	12,300
Single Vehicle, Non-Intersection		
Collision with train	$26,700	$39,100
Collision with bicycle	13,100	31,900
Injury in vehicle, jacknifed	5,200	2,000
Collision with fixed object in road	6,300	9,200
Overturned in road	10,000	9,400
Left road at curve	7,600	12,400
Left road on straight road	5,200	10,500
Other One Motor Vehicle, At Intersection and Non-Intersection		
Fell from moving vehicle	$15,000	$57,200
Collision with animal	4,800	1,800
Collision with other object	4,700	4,400
All others	5,200	2,000
Not stated	3,200	3,400

Source: National Safety Council

- Hazard Index -- The hazard index for each site was calculated by combining the seven hazard rating indices. The hazardness of each location was used to rank the sites.

E. Develop Recommended Improvement Plans

A recommended improvement plan has been developed based on the layout sketch, accident analysis, field notes, traffic volumes and movements, photos, site inspections and local interviews. The improvements are shown on the location sketch for each site contained in Chapter IV.

Recommended improvements have been separated into two categories:

1. Short range improvements which consist of traffic control and minor geometric modifications.

2. Longe range improvements including items such as major changes in alignment, reconstruction, new construction or recommendations related to future development in the area.

F. Cost Estimates

The cost estimates of the proposed improvements are based on recent bid prices for similiar projects. The costs are based on contract prices even through most of the short-term improvements can be accomplished by the county maintenance crew.

The estimated costs are used to determine the cost factor which is the improvement cost per vehicle entering the site over a five-year period. The five-year period represents the reasonable design life of the improvements.

Figure 10 is used to determine the cost factor for each site.

G. Calculate Priority Index

The priority index is determined by combining the hazard index and the cost index. The hazard index is given a 75 percent weight and the

cost index is weighted 25 percent. These calculations are shown in Chapter IV. The priority index is used to rank each site as shown in the priority listing in Chapter III.

H. Benefit/Cost Analysis

The Montana Department of Highways calculates the Benefit/Cost ratio of safety improvements in order to set priorities for on-system projects. It is possible that in the future, state or federal funds may be made available for off-system improvements. In anticipation of this possibility, the Benefit/Cost ratio for each site has been calculated using the MDOH method.

CHAPTER III

SUMMARY OF RECOMMENDATIONS

A. Improvement Priorities

Table 4 shows the final listing of improvement priorities based on the priority index which takes into account the hazardousness of each site and the cost of recommended improvements. The hazard index is given a 75 percent weight and the cost factor a 25 percent weight.

The Benefit/Cost ratio calculated using the Montana Department of Highway's method, is also shown for each site.

B. Implementation

The priority list should be used to develop an improvement schedule. The highest ranked site should be funded first and as funding becomes available, each site should be improved according to its respective rank.

If funds are not available to complete all improvements, traffic control device installation should be funded first. These are generally the most cost effective improvements and can be accomplished by the county maintenance crew. Widening, reconstruction or new construction improvements could be delayed until funding is available.

State law requires that all traffic control devices installed on the county road system conform to the standards set forth in the Manual on Uniform Traffic Control Devices for streets and highways (1978). The manual also specifies installation standards. By using uniform signs and markings and uniform placement, the driver becomes accustomed to obtaining clear information about the roadway by observing these devices.

TABLE 4

IMPROVEMENT PRIORITY LIST

Priority*	Site No.	Location	Index	Cost
1	4	Mahan and Hoyt Reservoir Road and Brazil Creek Road	73.66	$ 740
2	6	Cottage Road -- Fort Peck	71.00	1,140
3	5	6th Avenue Bridge -- Glasgow	69.95	4,310
4	2	Skylark Road -- Intersection of Landfill Road	60.99	1,200
5	1	Intersection of 2nd Avenue North and Montana, Ohio, and Minnesota Streets - Hinsdale	57.52	825
6	3	Skylark Road South of Golf Course	51.61	840
		Total cost		$9,055

*Montana Department of Highway's Benefit/Cost Priorities are the same as the Priority Index Priorities.

New materials such as flexible delineators should be considered, especially in areas where delineators are subjected to repeated vehicular impacts.

In preparing this report, conversations with county road superintendents revealed that several counties have developed unique methods to carry out their county road programs. For example, in Valley County the road superintendent has developed a lay-down bridge end hazard marker post that is used on bridges where there is heavy farm equipment traffic. The county road superintendent in Custer County has a program for constructing precast bridge decks during the winter months.

An exchange of road construction and maintenance methods by counties throughout the state is a valuable source of information that may result in cost savings and statewide uniformity.

C. On-Going Program

The majority of the improvements recommended in this report are low cost and can be included in the county maintenance budget. Following implementation of the improvements, the annual county accident report provided by the Montana Department of Justice, Highway Traffic Safety Division, should be used to determine if a reduction of accidents at the improved locations has resulted. This will also enable the county road superintendent to determine the most effective safety improvements.

The accident cluster map which will be provided annually can be used to locate other high accident sites that can be targeted for future safety improvements.

The methods have been set forth in detail to enable the county to set up an on-going annual safety improvement schedule.

The following is a summary of the on-going safety improvement process:

1. Set up safety improvement schedule to implement recommended improvements set forth in this report, in order of priority and as funds become available.

2. Obtain annual plots of accidents occurring on county roads from the Montana Department of Justice, Highway Traffic Safety Division.

3. Use annual accident plots to evaluate effectiveness of safety improvements that have been implemented.

4. Use annual accident plots to determine high accident locations to be included in the on-going safety improvement program.

5. Obtain detailed accident reports for the selected sites from the Department of Justice.

6. Develop on-going improvement plan.

D. Funding Sources

The funding source for the recommended improvements will generally be from the county road budget. However, there are several state and federal programs that can be used to fund special improvements on off-system roads. These sources are described below:

- Bridge Replacement Program -- Fifteen percent of the federal funds received by the Montana Department of Highways for bridge replacement are allocated for the replacement of bridges on county off-system roads. Each county designates a priority bridge for replacement and funds are allocated according to need.

- Railroad Crossing Safety Funds -- The Montana Department of Highways rates all railroad crossings in the state according to the degree of hazard. This takes into account train volumes, vehicular traffic volumes, sight distance and other site characteristics. Funds are allocated statewide based on the hazard ratings.

- Coal Board Funds -- County roads directly impacted by coal extraction activities, may be eligible for funds from the State Coal Board.

- Coal Board Planning Funds -- Each county receives an annual allocation of planning funds from the State Coal Funds. These funds cannot be used for capital expenditures but are earmarked exclusively for planning activities. These funds could be used to carry out engineering studies for the on-going safety improvements program.

- Montana Department of Justice Safety Funds -- This project has been funded by the Montana Department of Justice, Highway Traffic Safety Division. The Division will continue to compile accident reports for each county. Some funding may be available to carry out the planning for the on-going safety improvement program.

  The Highway Traffic Safety Division has also funded county road traffic counting programs by providing traffic counting equipment.

- Federal funding legislation allows the use of federal funds on off-system road improvements. In the future, these funds may be available through the Montana Department of Highways.

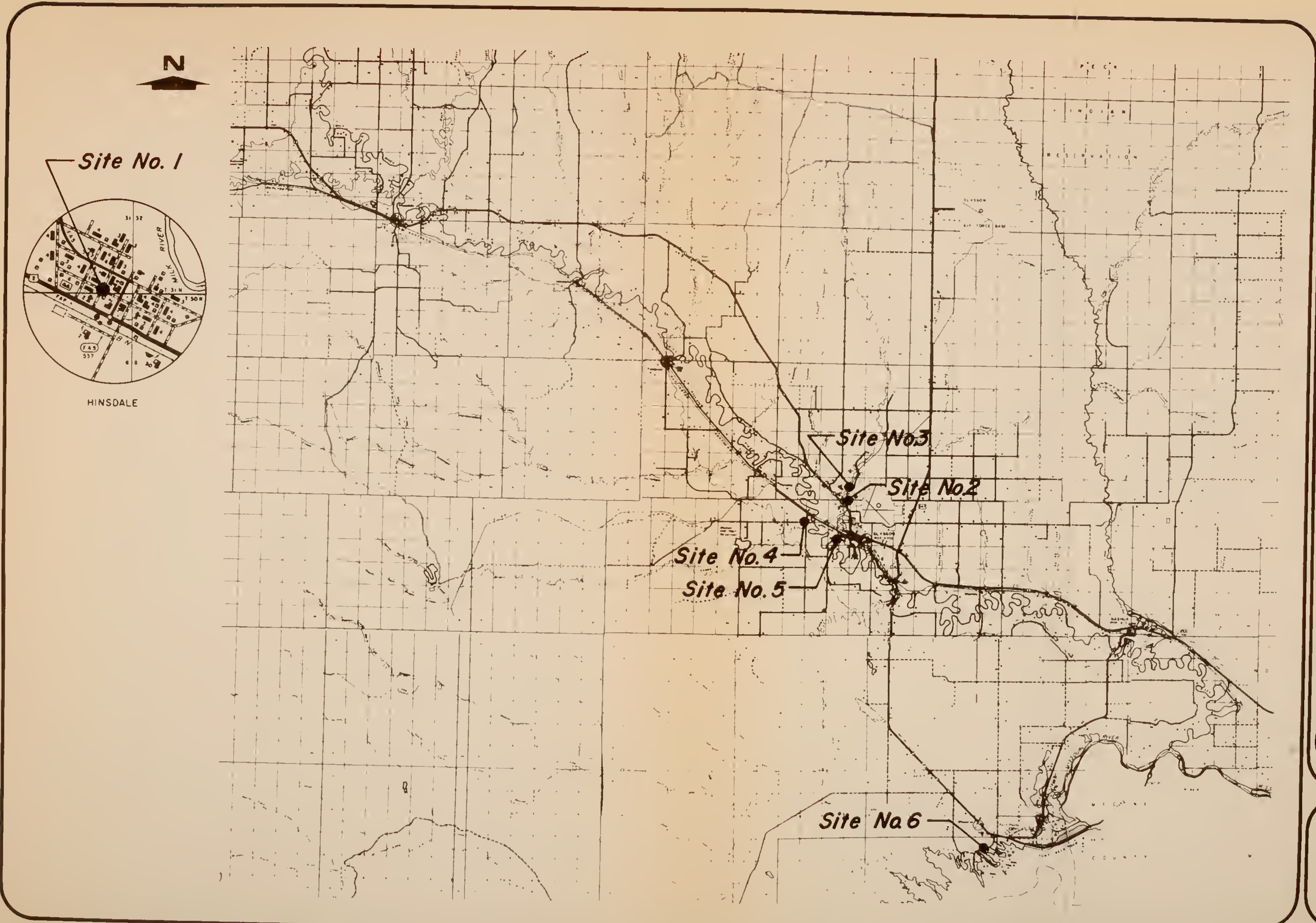
CHAPTER IV

SITE ANALYSIS

This chapter presents, in detail, the analysis of each of the sites.

The information for each site consists of the following:

1. General location map showing site locations within the county
2. Photos of the sites
3. Sketch plan showing existing conditions
4. Sketch plan showing recommended improvements
5. Accident summary
6. Hazard index and priority index calculations



SITE LOCATION MAP
Valley County

Site No. 1

SITE #1

INTERSECTION OF 2ND AVENUE NORTH AND MONTANA,
OHIO AND MINNESOTA STREETS IN HINSDALE

A. Description

This site consists of three intersections located in the uncorporated town of Hinsdale. The intersections are located along 2nd Avenue North at its' intersections with Montana, Ohio and Minnesota Streets.

Montana and Ohio Streets are residential access streets, 2nd Avenue North provides residential access as well as east-west access to the central business district. Minnesota Street is the main commercial street and provides access to the Hinsdale School.

All streets except Minnesota Street have a gravel surface with no curb and gutter. Minnesota Street is paved with curb and gutter.

Traffic control consists of a STOP sign on the west leg of 2nd Avenue North and Minnesota Street. There are parallel parking regulatory signs on the east side of Minnesota Street.

Observation of the traffic operations on the streets showed that drivers on 2nd Avenue North were using that street as a through route with side street traffic generally yeilding the right-of-way even though the side streets are not STOP signed.

The estimated average daily traffic on the streets within the site ranges from 75 vehicles per day (vpd) on Montana and Ohio Streets to 455 vpd on Minnesota Street.

Figure 1-1 shows the existing conditions.

B. Accident Characteristics

A total of five accidents occurred at these three intersections from 1979 through 1982. Three were angle collisions resulting from failure to yield the right-of-way, one involved a collision with a utility pole and one was a collision with a backing vehicle during snow removal.

All of the accidents occurred during the winter. Three occurred on Monday indicating that snow or ice build-up over the weekend may have contributed to icy road conditions that were present during two of the accidents.

Three accidents occurred during the day. There were no injuries during the four-year period, however, accidents involving injuries occurred at the intersection of 2nd Avenue North and Ohio Street in 1972 and 1978.

Accident diagrams are shown in Figure 1-1. A summary of accident characteristics is shown in Table 1-1.

C. Evaluation

The following factors were determined to be pertinent to the traffic operations at this site:

1. Gravel surfaces on 2nd Avenue North, Montana and Ohio Streets become rough and have a low skid resistance.

2. Absence of curb and gutter may contribute to poor drainage and winter icing problem.

3. Absence of curb and gutter makes it difficult to see the intersection approaches on the unpaved streets.

4. Hedges and trees at intersections reduce sight distance, expecially on the south leg of the intersection of 2nd Avenue North and Ohio Street.

5. There is a tendency for east-west traffic on 2nd Avenue North to assume the right-of-way.

D. Recommendations

The following improvements are recommended for this site. The improvements are shown on Figure 1-2.

Short Range

1. Make 2nd Avenue North a through street by installing STOP signs on the north and south approaches of Montana and Ohio Streets.

2. Trim hedge on southeast corner of 2nd Avenue North and Ohio Street to increase sight distance.

Long Range

No long range improvements are recommended, however, the paving and installation of curbs and gutters on the existing gravel streets would result in better drainage and improved driving surface. This improvement could not be justified based on increasing safety alone.

E. Cost Estimates

Short Range

Item	Quantity	Unit	Unit Cost	Total Cost
Install 24"X24", R1-1, STOP sign	4	ea.	$130	$520
Trim trees/hedges	-	-	lump sum	$100
			Total cost	$620

F. Hazard and Priority Indices

Based on the information collected and the foregoing analysis, the hazard index for this location is determined to be 43.69. The priority index is 57.52. The calculations are shown in Table 1-2.

ACCIDENT SUMMARY

Table 1-1

SITE NUMBER 1 ACCIDENT PERIOD 1979 - 1982

NUMBER OF ACCIDENTS BY YEAR

1979	1980	1981	1982
2		1	2

NUMBER OF ACCIDENTS BY DAY OF WEEK

Sun.	Mon.	Teus.	Wed.	Thurs.	Fri.	Sat.
	3				1	1

NUMBER OF ACCIDENTS BY MONTH

Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
2	1										2

NUMBER OF ACCIDENTS BY TIME OF DAY

-- AM --												-- PM --											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
							2									1		1					1

NUMBER OF ACCIDENTS BY LIGHT CONDITIONS

Day-light	Dark	Dawn	Dusk
3	2		

NUMBER OF ACCIDENTS BY ROAD CONDITIONS

Dry	Wet	Snow	Ice	Other
3			2	

NUMBER OF ACCIDENTS BY WEATHER CONDITIONS

Clear	Rain	Snow	Fog
5			

NUMBER OF ACCIDENTS BY ACCIDENT TYPE

Angle	Turn	Rear End	Fixed Object	Ped.	Animal	Side-swipe	Non-Col	Head-on	Backing
3			1						1

NUMBER OF ACCIDENTS BY POSSIBLE VIOLATION

No Violat.	Drinking	Reckless Driving	Speed	Right-of-Way	Improper Passing	Improper Backing	Improper Turning	Other
2		1	1	2				1

NUMBER OF ACCIDENTS BY SEVERITY

	1979	1980	1981	1982
Injury				
Fatality				
Property Dam. Only	2		1	2

NUMBER OF ACCIDENTS ALCOHOL INVOLVED

0

HAZARD INDEX CALCULATION

Table 1-2

Site Number 1 Date December 1983

Site Description 2nd Avenue North & Montana, Ohio & Minnesota Streets, Hinsdale

Indicator	Data Value		Indicator Value		Weight		Partial H.I.'s
Number of Accidents	0.42	acc/yr	14	X	0.164	=	2.30
Accident Rate	4.09	acc/MVE	58	X	0.225	=	13.05
Accident Severity	7300	dollars	54	X	0.191	=	10.31
Volume/Capacity Ratio	0.007		5	X	0.082	=	0.41
Sight Distance Ratio	0.61	(wt.ave.)	83	X	0.074	=	6.14
Driver Expectancy	2.7	(wt.ave.)	47	X	0.149	=	7.00
Information System Deficiencies	2.3	(wt.ave.)	39	X	0.115	=	4.48

Hazard Index: 43.69

Cost of Recommended Improvements: $620

Cost Factor: 99

Priority Index = Hazard Index X .75 + Cost Factor X .25

43.69 X .75 + 99 X .25 = 57.52

Note: Average hazard index for three intersections included in Site #1.

LEGEND

- Power Pole
- Fire Hydront
- Concrete Sidewolk
- —75 Average Daily Traffic
- Existing Pavement

SYMBOLS

- Moving Vehicle
- Backing Vehicle
- Pedestrian Path
- Parked Vehicle
- Fixed Object
- Fatol Accident
- Injury Accident

COLLISION TYPES

- Reor End
- Head On
- Side Swipe
- Out of Contral
- Left Turn
- Right Angle

CONDITIONS

WEATHER:
F=Fog C=Clear R=Rain
S=Snow SL=Sleet

SURFACE: D=Dry W=Wet I=Icy

TIME → 1600 T/2/82 ← DATE
WEATHER → C D DARK ← LIGHT
SURFACE

1 Existing Conditions & Accidents

Intersection of 2nd Avenue North and Montana, Ohio, and Minnesota Streets in Hinsdale

SITE NO. 1
Valley County

Fig. No.
1·1

SITE NO. 1 Recommended Improvements

Valley County

Intersection of 2nd Avenue North and Montana, Ohio, and Minnesota Streets in Hinsdale

Fig. No. 1-2

Site No. 2

SITE NO.2 – SKYLARK ROAD - INTERSECTION OF LANDFILL ROAD

North Approach

South Approach

SITE #2

SKYLARK ROAD AT THE INTERSECTION WITH THE LANDFILL ROAD

A. Description

This site is a curve on Skylark Road, 700 feet north of U.S. Highway 2, at the intersection of the landfill road. Skylark Road provides access to the landfill, golf course, and residential development.

The road is paved with a 24-foot surface. A left curve sign and 35 MPH speed sign are located on the south approach. The north approach has a reverse right turn sign.

The estimated average daily traffic on this road section is 810 vpd on the south leg, 100 vpd on the landfill road and 710 vpd on the north leg. Figure 2-1 shows the existing conditions.

B. Accident Characteristics

A total of four accidents occured at this location from 1979 through 1982. Three of the accidents occurred during the winter during icy road conditions. All accidents happened during daylight hours with three involving collisions between two vehicles and the other, a motorcycle accident resulting in a fatality, was due to loss of control and excessive speed. Accident diagrams are shown on Figure 2-1. Accident characteristics are summarized in Table 2-1.

C. Evaluation

The following factors were determined from the accidents and characteristics of the site:

1. Failure to yield the right-of-way on the roadway due to icy conditions.

2. Speeds in excess of 35 MPH.

D. Recommendations

The following improvements are recommended for this site. The recommendations are shown on Figure 2-2.

Short Range

1. Replace the existing 30-inch X 30-inch W1-2L (left curve) sign on the south approach with a 30-inch X 30-inch W1-4L reverse curve left sign.

2. Install a 24-inch X 24-inch R1-1 STOP sign on the approach of the landfill access road.

3. Install delineators on the curves spaced as shown feet on the curve.

4. Install a 35 MPH advisory speed plate on the existing 30-inch X 30-inch W1-4R reverse right curve sign on the north approach.

5. Restrip centerline and shoulder stripes.

6. Sand both curves during icy conditions.

Long Range

Remove railroad track and crossbucks from landfill road when railroad is officially abandoned.

E. Cost Estimates

Short Range

Item	Quantity	Unit	Unit Cost	Total Cost
Replace existing W1-2L with 30"X30" W1-4L	1	ea.	$ 75	$ 75
Install 24"X24" R1-1 STOP sign and post	1	ea.	$130	$ 130
Install delineators and posts	17	ea.	$ 20	$ 340

Item	Quantity	Unit	Unit Cost	Total Cost
Install 18"X18", W13-1, 35 MPH speed advisory plate on existing post	1	ea.	$ 35	$ 35
			Total cost	$580

Long Range

Should be included in general salvage of railroad facilities.

F. Hazard and Priority Indices

The hazard and priority indices are 48.65 and 60.99 for this site, respectively. The calculations are shown in Table 2-2.

ACCIDENT SUMMARY

Table 2-1

SITE NUMBER 2 ACCIDENT PERIOD 1979 - 1982

NUMBER OF ACCIDENTS BY YEAR

1979	1980	1981	1982
	1	1	2

NUMBER OF ACCIDENTS BY DAY OF WEEK

Sun.	Mon.	Teus.	Wed.	Thurs.	Fri.	Sat.
1			1	1		1

NUMBER OF ACCIDENTS BY MONTH

Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	1						1				1

NUMBER OF ACCIDENTS BY TIME OF DAY

-- AM --																						-- PM --	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
											2			1		1							

NUMBER OF ACCIDENTS BY LIGHT CONDITIONS

Day-light	Dark	Dawn	Dusk
4			

NUMBER OF ACCIDENTS BY ROAD CONDITIONS

Dry	Wet	Snow	Ice	Other
1			3	

NUMBER OF ACCIDENTS BY WEATHER CONDITIONS

Clear	Rain	Snow	Fog
4			

NUMBER OF ACCIDENTS BY ACCIDENT TYPE

Angle	Turn	Rear End	Fixed Object	Ped.	Animal	Side-swipe	Non-Col	Head-on	Backing
1	1		1			1			

NUMBER OF ACCIDENTS BY POSSIBLE VIOLATION

No Violat.	Drinking	Reckless Driving	Speed	Right-of-Way	Improper Passing	Improper Backing	Improper Turning	Other
1		1	1	1			1	1

NUMBER OF ACCIDENTS BY SEVERITY

	1979	1980	1981	1982
Injury			1	1
Fatality		1		1
Property Dam. Only				

NUMBER OF ACCIDENTS ALCOHOL INVOLVED

0

HAZARD INDEX CALCULATION

Table 2-2

Site Number 2 Date December 1983

Site Description Skylark Road at Landfill Access Road

Indicator	Data Value		Indicator Value		Weight		Partial H.I.'s
Number of Accidents	1.00	acc/yr	25	X	0.164	=	4.10
Accident Rate	3.6	acc/MVE	66	X	0.225	=	14.85
Accident Severity	12975	dollars	70	X	0.191	=	13.37
Volume/Capacity Ratio	.27		42	X	0.082	=	3.44
Sight Distance Ratio	1.00	(wt.ave.)	32	X	0.074	=	2.37
Driver Expectancy	2.00	(wt.ave.)	32	X	0.149	=	4.77
Information System Deficiencies	3.00	(wt.ave.)	50	X	0.115	=	5.75

Hazard Index: 48.65

Cost of Recommended Improvements: $1,200

Cost Factor: 98

Priority Index = Hazard Index X .75 + Cost Factor X .25

48.65 X .75 + 98 X .25 = 60.99

SYMBOLS

- Moving Vehicle
- Backing Vehicle
- Pedestrian Path
- Parked Vehicle
- Fixed Object
- Fatal Accident
- Injury Accident

COLLISION TYPES

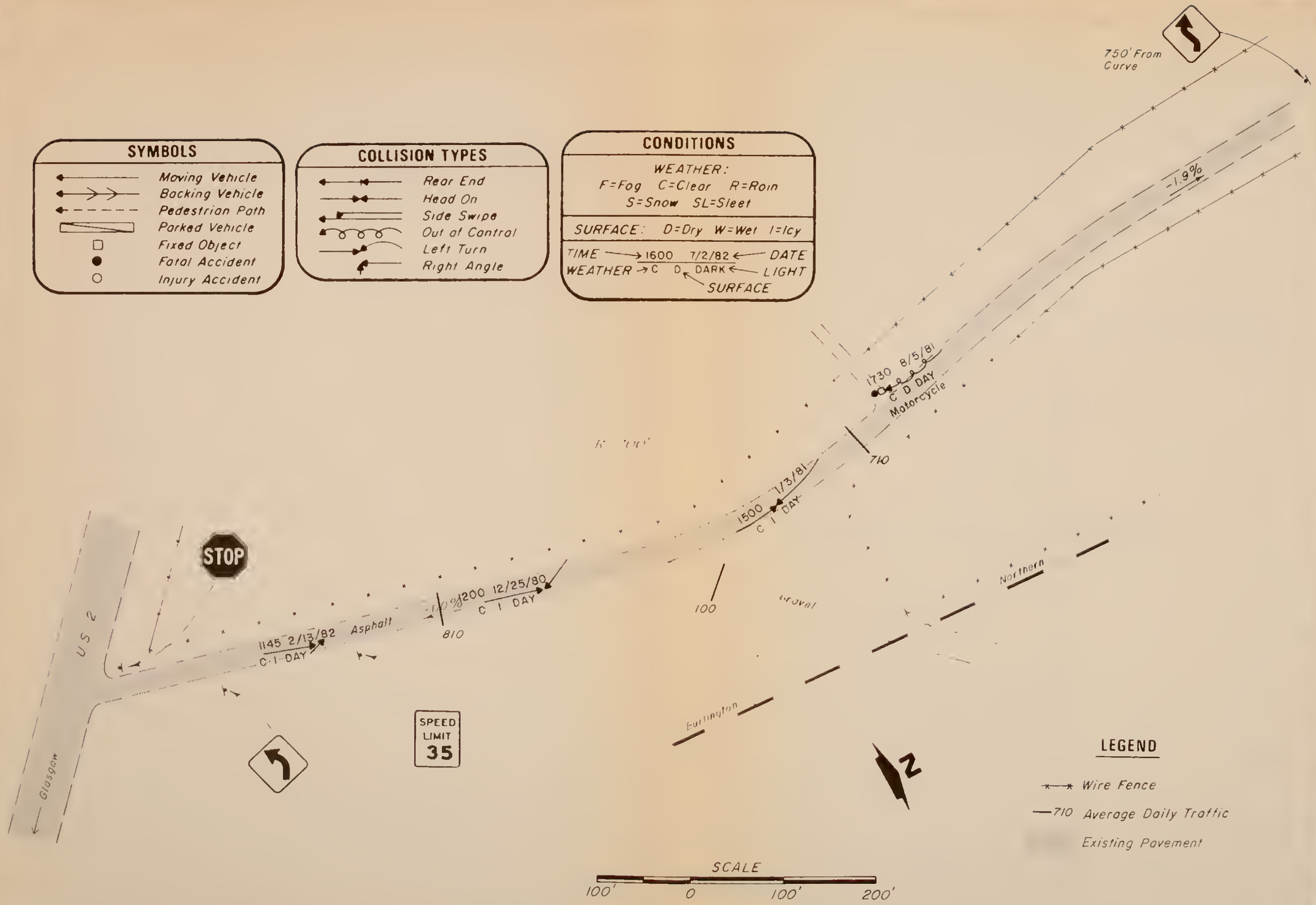
- Rear End
- Head On
- Side Swipe
- Out of Control
- Left Turn
- Right Angle

CONDITIONS

WEATHER:
F=Fog C=Clear R=Rain
S=Snow SL=Sleet

SURFACE: D=Dry W=Wet I=Icy

TIME → 1600 7/2/82 ← DATE
WEATHER → C D DARK ← LIGHT
SURFACE



LEGEND

- Wire Fence
- 710 Average Daily Traffic
- Existing Pavement

Existing Conditions & Accidents

Skylark Road and Landfill Road Intersection

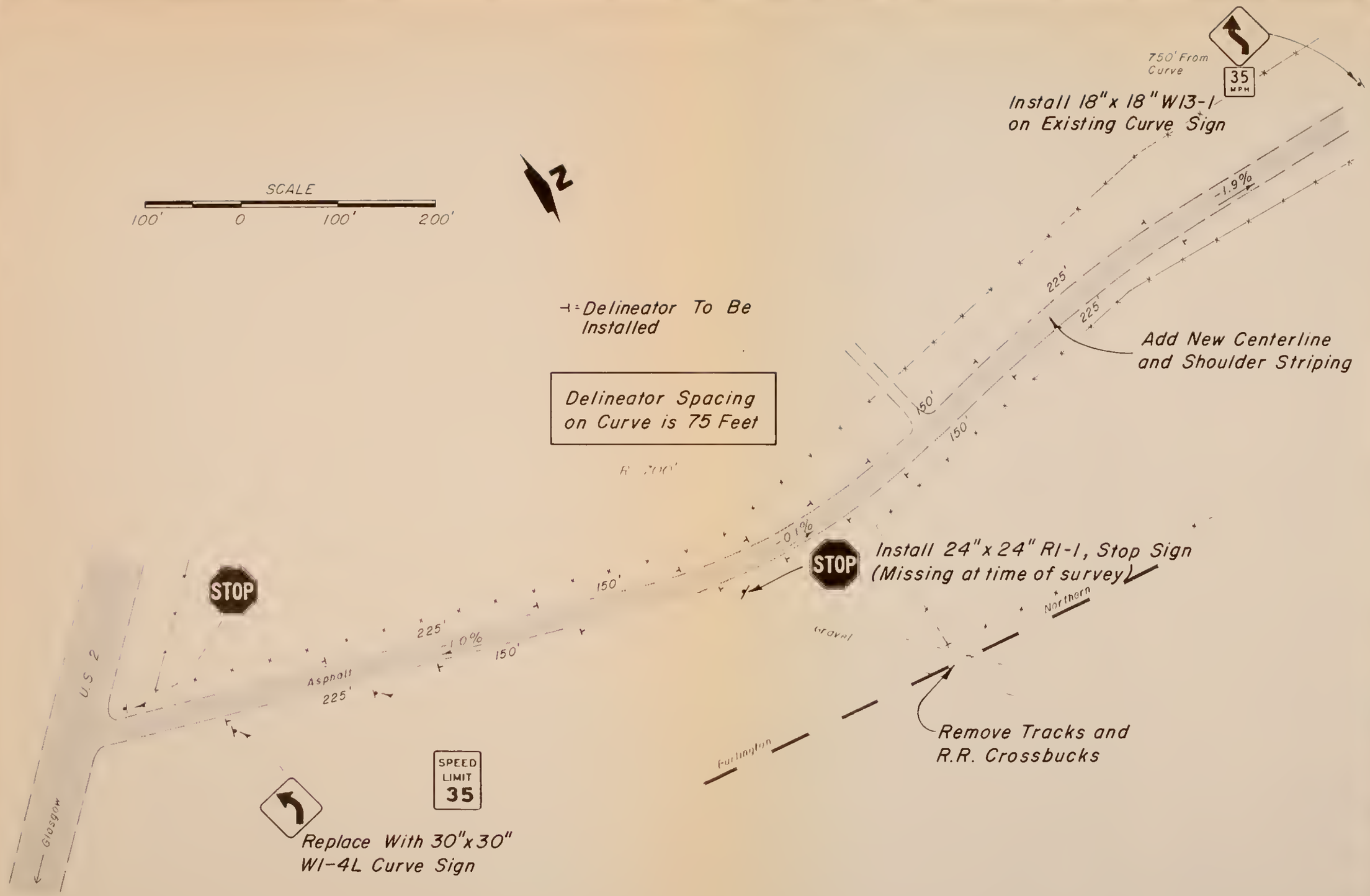
SITE NO. 2

Valley County

Fig. No. 2-1

SITE NO. 2
Recommended Improvements
Skylark Road and Landfill Road Intersection
Valley County

Fig. No. 2-2



Site No. 3

SITE NO. 3 - SKYLARK ROAD SOUTH OF GOLF COURSE

Northeast Approach

South Approach

SITE #3

SKYLARK ROAD -- CURVE SOUTHWEST OF GOLF COURSE

A. Description

This site is located on Skylark Road 0.7 miles north of U.S. Highway 2. The road provides access to the golf course and residential development.

The road is paved with a 24-foot surface. There is ample sight distance from both approaches of the curve.

The estimated average daily traffic through the section is 570 vpd on the south leg and 340 vpd on the east leg. Figure 3-1 shows existing conditions.

B. Accident Characteristics

One reported accident has occurred at this site over the past four years, however, there is evidence that at least one westbound vehicle has left the road at the curve. The reported accident involved a westbound vehicle leaving the roadway due to excessive speed. The accident occurred at night during the fall of the year. Figure 3-1 shows accident diagrams and Table 3-1 shows a summary of accident characteristics.

C. Evaluation

The following factors were determined from the accident analysis and field survey:

1. Field observations indicate excessive speeds in this area.
2. A background roadway showing from the south approach could cause a driver to perceive a straight road.
3. Shoulder and centerline striping has been worn off.

D. Recommendations

Short Range

The following short term improvements are recommended (see Figure 3-2):

1. Install delineators spaced as shown feet on curve.
2. Install 18-inch X 18-inch W13-1, 35 MPH speed advisory plates on existing curve signs on the south and east approaches.
3. Install 48-inch X 24-inch W1-6L near P.I. of curve in line with the westbound approach.
4. Install 48-inch X 24-inch W1-6R near P.I. of curve in line with the northbound approach.
5. Restripe centerline and shoulder stripes.
6. Sand during icy conditions.

Long Range

Remove railroad track and crossbucks from east leg when railroad is officially abandoned.

E. Cost Estimates

Short Range

Item	Quantity	Unit	Unit Cost	Total Cost
Install delineators and posts	28	ea.	$ 20	$560
Install 18"X18", W13-1, 35 MPH speed advisory plate on existing post	2	ea.	$ 35	$ 70
Install 48"X24", W1-6R & L arrows	2	ea.	$105	$210
			Total cost	$840

Long Range

Should be included in general salvage of railroad facilities.

F. Hazard and Priority Indices

The hazard and priority indices are 36.15 and 51.61, respectively, for this site. The calculations are shown in Table 3-2.

ACCIDENT SUMMARY

Table 3-1

SITE NUMBER 3 ACCIDENT PERIOD 1979 - 1982

NUMBER OF ACCIDENTS BY YEAR

1979	1980	1981	1982
			1

NUMBER OF ACCIDENTS BY DAY OF WEEK

Sun.	Mon.	Teus.	Wed.	Thurs.	Fri.	Sat.
		1				

NUMBER OF ACCIDENTS BY MONTH

Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
									1		

NUMBER OF ACCIDENTS BY TIME OF DAY

-- AM --												-- PM --											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
											1												

NUMBER OF ACCIDENTS BY LIGHT CONDITIONS

Day-light	Dark	Dawn	Dusk
	1		

NUMBER OF ACCIDENTS BY ROAD CONDITIONS

Dry	Wet	Snow	Ice	Other
1				

NUMBER OF ACCIDENTS BY WEATHER CONDITIONS

Clear	Rain	Snow	Fog
1			

NUMBER OF ACCIDENTS BY ACCIDENT TYPE

Angle	Turn	Rear End	Fixed Object	Ped.	Animal	Side-swipe	Non-Col	Head-on	Backing
			1						

NUMBER OF ACCIDENTS BY POSSIBLE VIOLATION

No Violat.	Drinking	Reckless Driving	Speed	Right-of-Way	Improper Passing	Improper Backing	Improper Turning	Other
			1					

NUMBER OF ACCIDENTS BY SEVERITY

	1979	1980	1981	1982
Injury				1
Fatality				
Property Dam. Only				

NUMBER OF ACCIDENTS ALCOHOL INVOLVED

0

HAZARD INDEX CALCULATION

Table 3-2

Site Number 3 Date December 1983

Site Description Skylark Road -- Curve South of Golf Course

Indicator	Data Value	Indicator Value		Weight		Partial H.I.'s
Number of Accidents	0.25 acc/yr	12	X	0.164	=	1.97
Accident Rate	1.5 acc/MVE	15	X	0.225	=	3.38
Accident Severity	12400 dollars	69	X	0.191	=	13.18
Volume/Capacity Ratio	.08	25	X	0.082	=	2.05
Sight Distance Ratio	1.00 (wt.ave.)	32	X	0.074	=	2.37
Driver Expectancy	3.0 (wt.ave.)	50	X	0.149	=	7.45
Information System Deficiencies	3.0 (wt.ave.)	50	X	0.115	=	5.75

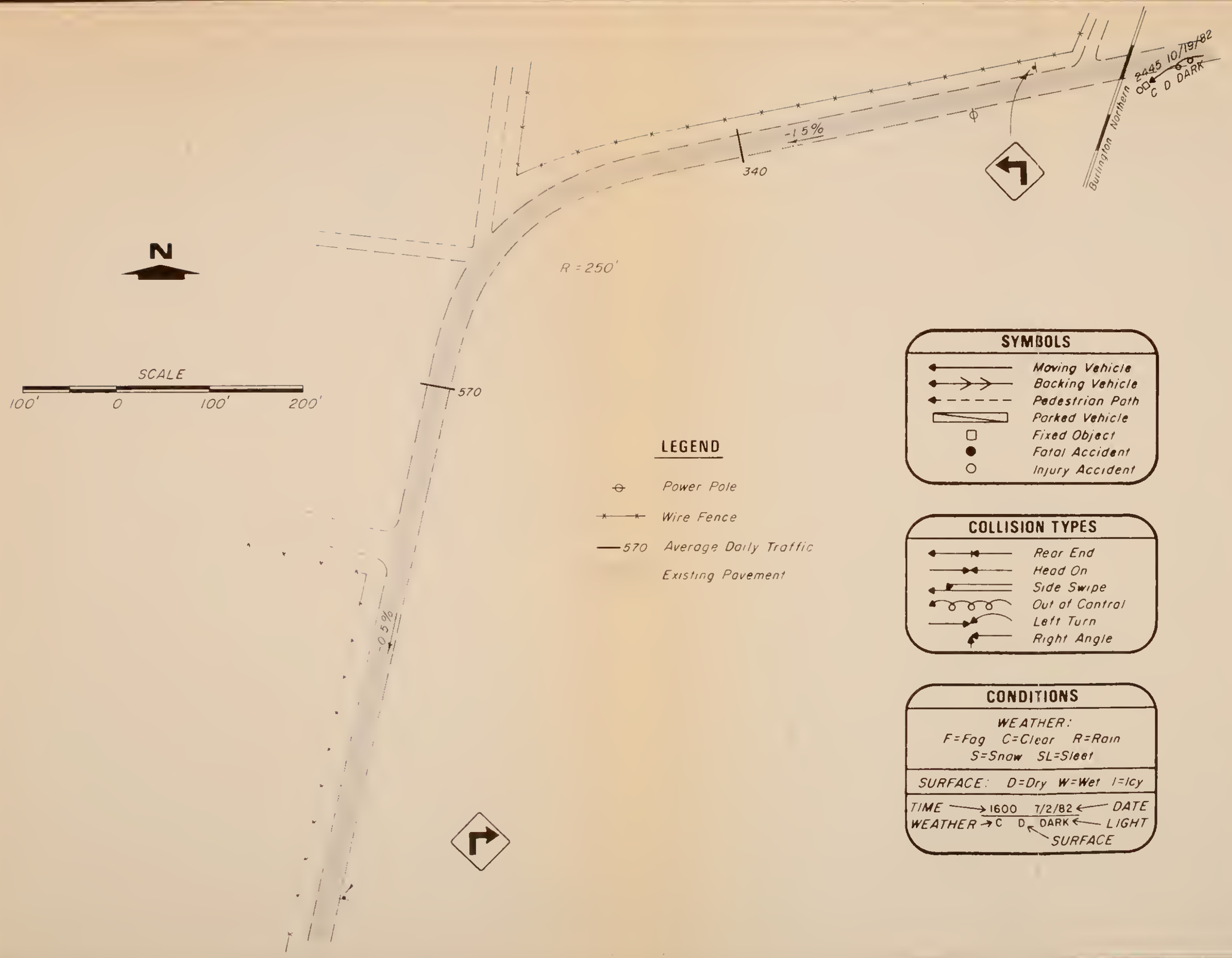
Hazard Index: 36.15

Cost of Recommended Improvements: $840

Cost Factor: 98

Priority Index = Hazard Index X .75 + Cost Factor X .25

36.15 X .75 + 98 X .25 = 51.61



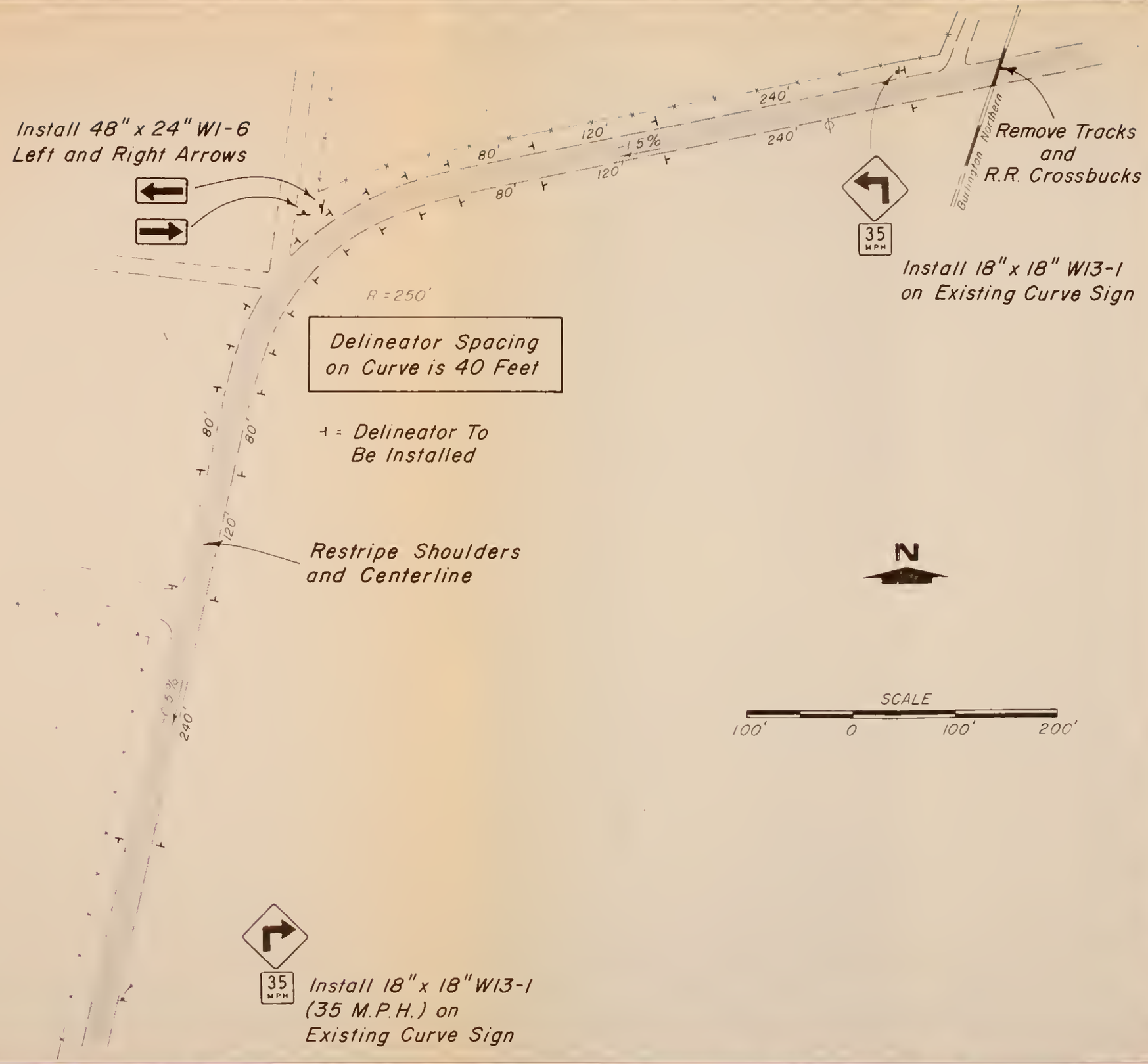
Existing Conditions & Accidents

Skylark Road – South of Golf Course

SITE NO. 3

Valley County

Fig. No. 3-1



Recommended Improvements

Skylark Road - South of Golf Course

SITE NO. 3

Valley County

Fig. No. 3.2

Site No. 4

SITE NO.4 - MAHAN · HOYT RESERVOIR ROAD
and
BRAZIL CREEK ROAD

North Approach

South Approach

SITE #4

MAHAN AND HOYT RESERVOIR ROAD

A. Description

This site is located approximately 0.9 miles south of the intersection of Montana Highway 246 and the Mahan and Hoyt Reservoir Road.

The road has a gravel surface. Traffic on the road includes travel to and from farms in the area, farm to market travel and recreational travel by fishermen and hunters. The average daily traffic is estimated to be 300 vpd on the north leg, 230 vpd on the south leg and 70 vpd on the east leg. Figure 4-1 shows existing conditions.

B. Accident Characteristics

Four accidents have occurred at this location during the four-year period from 1979 through 1982. All of the accidents happened during the work week with three occurring during the spring months. The most common accident was leaving the road due to excessive speed. Figure 4-1 shows the accident diagrams and Table 4-1 shows a summary of accident characteristics.

C. Evaluation

The following factors pertaining to the site were determined from the field survey and accident analysis:

1. Several traffic control signs at the site are obscured by trees, brush, and grass.
2. The gravel road on the curve washboards due to heavy farm to market truck traffic.
3. Traffic increases during hunting season out-of-county hunters are not familiar with the roads' characteristics.

D. Recommendations

The recommended improvements are shown on Figure 4-2.

Short Range

1. Clear brush, trees and grass at locations shown on Figure 4-2.

2. Raise existing object markers, OM-3R and L at bridge ends.

3. Install 18-inch X 24-inch, W1-8R, Chevron alignment sign on northwest leg as shown on Figure 4-2.

4. Install 48-inch X 24-inch, W1-7, double head arrow on curve on the east leg as shown on Figure 4-2.

5. Grade curves to maintain smooth surface.

Long Range

None.

E. Cost Estimate

Short Range

Item	Quantity	Unit	Unit Cost	Total Cost
Clear trees, brush, and grass			lump sum	$200
Raise existing object markers at bridge ends -- new lay-down object marker posts	4	ea.	$ 50	$200
Install 18"X24", W1-8R Chevron alignment sign with post	1	ea.	$130	$130
Install 48"X24", W1-7, double head arrow sign	1	ea.	$210	$210
Grade curves		normal maintenance		____
			Total cost	$740

F. Hazard and Priority Indices

The hazard and priority indices are 65.88 and 73.66, respectively, for this site. The calculations are shown in Table 4-2.

ACCIDENT SUMMARY

Table 4-1

SITE NUMBER 4 ACCIDENT PERIOD 1979 - 1982

NUMBER OF ACCIDENTS BY YEAR

1979	1980	1981	1982
	1	3	

NUMBER OF ACCIDENTS BY DAY OF WEEK

Sun.	Mon.	Teus.	Wed.	Thurs.	Fri.	Sat.
	1		1		2	

NUMBER OF ACCIDENTS BY MONTH

Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	1			1	2						

NUMBER OF ACCIDENTS BY TIME OF DAY

-- AM -- -- PM --

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
		1										1											2

NUMBER OF ACCIDENTS BY LIGHT CONDITIONS

Day-light	Dark	Dawn	Dusk
1	3		

NUMBER OF ACCIDENTS BY ROAD CONDITIONS

Dry	Wet	Snow	Ice	Other
3	1			

NUMBER OF ACCIDENTS BY WEATHER CONDITIONS

Clear	Rain	Snow	Fog
4			

NUMBER OF ACCIDENTS BY ACCIDENT TYPE

Angle	Turn	Rear End	Fixed Object	Ped.	Animal	Side-swipe	Non-Col	Head-on	Backing
	1		2				1		

NUMBER OF ACCIDENTS BY POSSIBLE VIOLATION

No Violat.	Drinking	Reckless Driving	Speed	Right-of-Way	Improper Passing	Improper Backing	Improper Turning	Other
	1		2				1	

NUMBER OF ACCIDENTS BY SEVERITY

	1979	1980	1981	1982
Injury				
Fatality				
Property Dam. Only		1	3	

NUMBER OF ACCIDENTS ALCOHOL INVOLVED

1

HAZARD INDEX CALCULATION

Table 4-2

Site Number 4 Date December 1983

Site Description Mahan and Hoyt Reservoir Road

Indicator	Data Value		Indicator Value		Weight		Partial H.I.'s
Number of Accidents	1.00	acc/yr	25	X	0.164	=	4.10
Accident Rate	9.13	acc/MVE	98	X	0.225	=	22.05
Accident Severity	10500	dollars	66	X	0.191	=	12.61
Volume/Capacity Ratio	.10		28	X	0.082	=	2.30
Sight Distance Ratio	.50	(wt.ave.)	100	X	0.074	=	7.40
Driver Expectancy	4.0	(wt.ave.)	66	X	0.149	=	9.83
Information System Deficiencies	4.0	(wt.ave.)	66	X	0.115	=	7.59

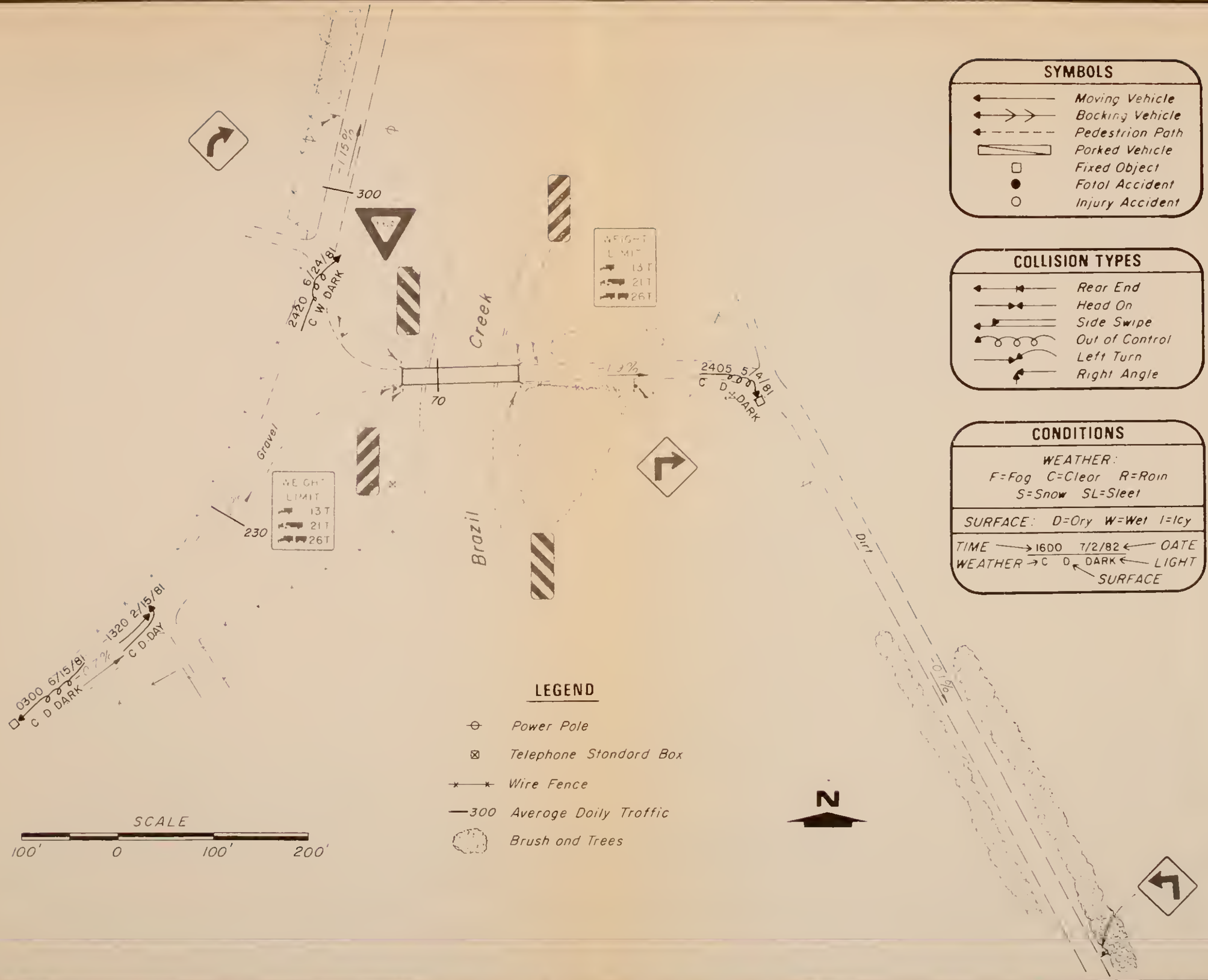
Hazard Index: 65.88

Cost of Recommended Improvements: $740

Cost Factor: 97

Priority Index = Hazard Index X .75 + Cost Factor X .25

65.88 X .75 + 97 X .25 = 73.66



SYMBOLS

- Moving Vehicle
- Backing Vehicle
- Pedestrian Path
- Parked Vehicle
- Fixed Object
- Fatal Accident
- Injury Accident

COLLISION TYPES

- Rear End
- Head On
- Side Swipe
- Out of Control
- Left Turn
- Right Angle

CONDITIONS

WEATHER:
F=Fog C=Clear R=Rain
S=Snow SL=Sleet

SURFACE: D=Dry W=Wet I=Icy

TIME → 1600 7/2/82 ← DATE
WEATHER → C D DARK ← LIGHT
SURFACE

LEGEND

- Power Pole
- Telephone Standard Box
- Wire Fence
- 300 Average Daily Traffic
- Brush and Trees

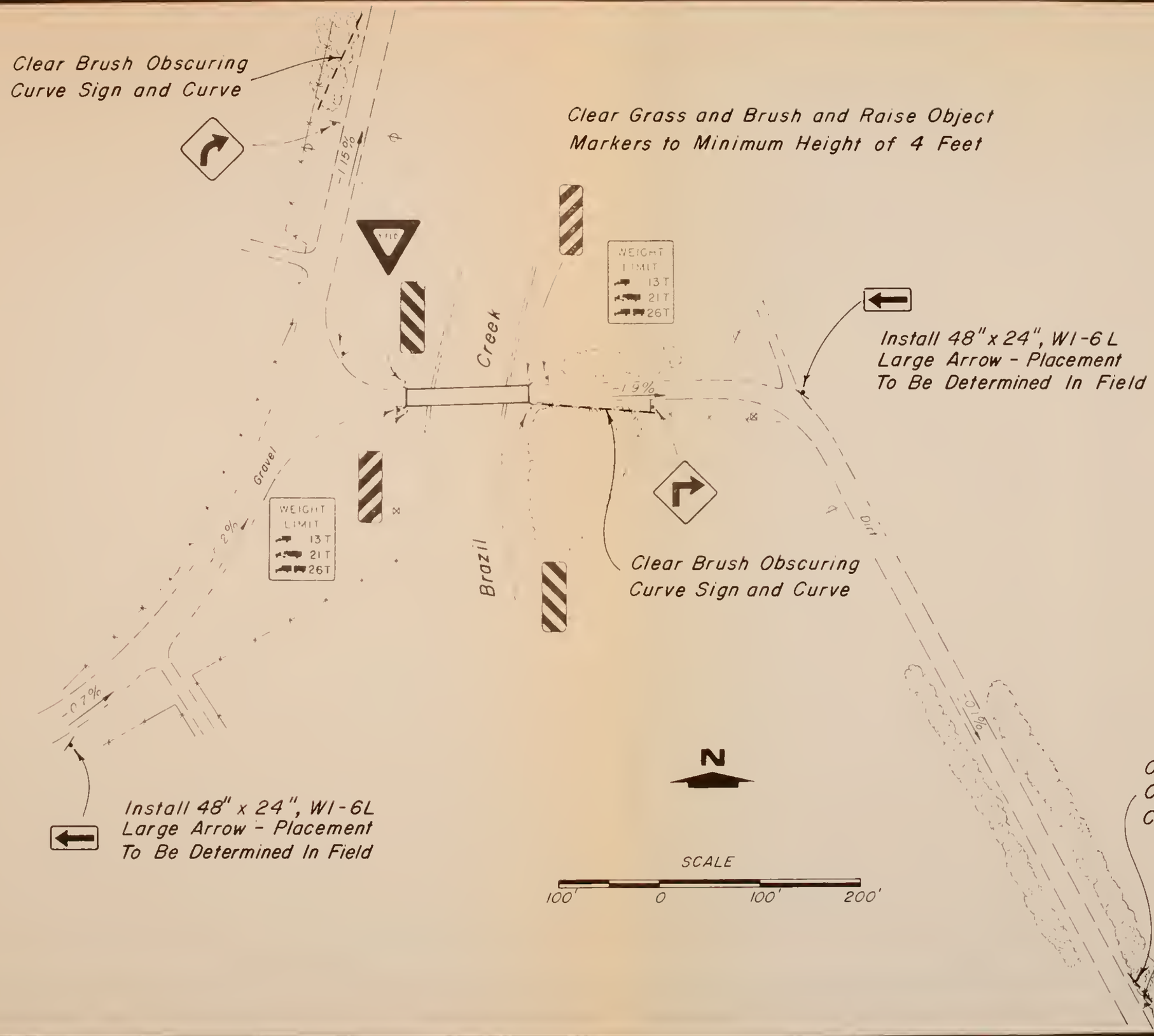
Existing Conditions & Accidents

Mahan and Hoyt Reservoir Road

SITE NO. 4

Valley County

Fig. No. 4-1



SITE NO. 4
Recommended Improvements
Mahan and Hoyt Reservoir Road
Valley County

Fig. No.
4-2

Site No. 5

SITE NO. 5 - 6th AVENUE BRIDGE - GLASGOW

East Approach (Winter)

West Approach (Winter)

East Approach (Fall)

West Approach (Fall)

SITE #5

6TH AVENUE BRIDGE -- GLASGOW

A. Description

This site is located southwest of the Glasgow City limits at a single lane bridge spanning the Milk River.

The road approaches to the bridge are gravel surfaced. The roadway approaches to the bridge are 20 feet in width, the bridge is 17 feet wide with a single, plank surfaced, driving lane.

The roadway serves primarily farm to market traffic. The estimated average daily traffic is 310 vpd on the north approach and 290 vpd on the south approach. These volumes have high seasonal and daily variations due to crop harvest, auction days, and other farm and ranching functions which affect the traffic.

The Montana Department of Highways has rated the allowable weight limit for the bridge as follows: 2 axle -- 11 tons; 3 axle -- 16 tons; and 4 axle -- 22 tons.

B. Accident Characteristics

Four accidents have occurred at this site from 1979 through 1982. All accidents occurred on the weekend during fall and winter months.

Two of the accidents were on the bridge, one involving a collision with the bridge end and the other involving a headon collision on the bridge. The other two accidents were the result of vehicles leaving the road on the south bridge approach. Two of the accidents were the result of excessive speed. Figure 5-1 shows the accident diagrams and Table 5-1 shows a summary of accident characteristics.

C. Evaluation

The following factors pertaining to the site were determined from the field survey and accident analysis:

1. The bridge structure and trees block the line of sight between the bridge approaches.

2. The bridge weight limit is 11, 16 and 22 tons for 2, 3 and 4 axle units, respectively.

3. East bridge ends are steel railing with unprotected ends.

D. Recommendations

The recommended improvements are shown on Figure 5-2.

Short Range

1. Replace existing 30-inch X 30-inch W1-1R turn sign on west approach with a 30-inch X 30-inch W1-2R curve sign.

2. Add a 30-inch X 30-inch W1-2L curve sign to Narrow Bridge Sign on east approach.

3. Replace existing guard rail with standard guard rail with rounded ends on east approach. Relocate bridge and hazard markers.

4. Lower wooden guard rail on west approach to standard height and supplement with standard guard rail.

5. Clear brush and trees on south side of west approach.

6. Install 11T-16T-22T, 30-inch X 30-inch, R12-5 bridge weight limit sign at both approaches.

Long Range

1. Replace bridge with a new structure -- cost to be determined by preliminary design.

E. Cost Estimate

Short Range

Item	Quantity	Unit	Unit Cost	Total Cost
Replace 30"X30", W1-1R turn sign with 30"X30", W1-2R curve sign	1	ea.	$75	$75
Add 30"X30", W1-2L curve sign to existing post	1	ea.	$75	$75
Clear brush and trees		lump sum		$200
Install 30"X36", R12-5 bridge weight limit signs	2	ea.	$180	$360
Install standard guard rail at both ends	400	lin.ft.	$9	$3,600
			Total cost	$4,310

Long Range

Item	Quantity	Unit	Unit Cost	Total Cost
Replace bridge -- cost to be determined by preliminary design				

F. Hazard and Priority Indices

The hazard and priority indices are 65.60 and 72.95, respectively, for this site. The calculations are shown in Table 5-2.

ACCIDENT SUMMARY

Table 5-1

SITE NUMBER 5 ACCIDENT PERIOD 1979 - 1982

NUMBER OF ACCIDENTS BY YEAR

1979	1980	1981	1982
1	1	1	1

NUMBER OF ACCIDENTS BY DAY OF WEEK

Sun.	Mon.	Teus.	Wed.	Thurs.	Fri.	Sat.
					3	1

NUMBER OF ACCIDENTS BY MONTH

Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1							1	1		1	

NUMBER OF ACCIDENTS BY TIME OF DAY

-- AM --												-- PM --											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
													1								2	1	

NUMBER OF ACCIDENTS BY LIGHT CONDITIONS

Day-light	Dark	Dawn	Dusk
1	3		

NUMBER OF ACCIDENTS BY ROAD CONDITIONS

Dry	Wet	Snow	Ice	Other
3	1		1	

NUMBER OF ACCIDENTS BY WEATHER CONDITIONS

Clear	Rain	Snow	Fog
4			

NUMBER OF ACCIDENTS BY ACCIDENT TYPE

Angle	Turn	Rear End	Fixed Object	Ped.	Animal	Side-swipe	Non-Col	Head-on	Backing
			3					1	

NUMBER OF ACCIDENTS BY POSSIBLE VIOLATION

No Violat.	Drinking	Reckless Driving	Speed	Right-of-Way	Improper Passing	Improper Backing	Improper Turning	Other
2			2					

NUMBER OF ACCIDENTS BY SEVERITY

	1979	1980	1981	1982
Injury		1		
Fatality				
Property Dam. Only	1		1	1

NUMBER OF ACCIDENTS ALCOHOL INVOLVED

0

HAZARD INDEX CALCULATION

Table 5-2

Site Number 5 **Date** December 1983

Site Description 6th Avenue Bridge --- Glasgow

Indicator	Data Value		Indicator Value		Weight		Partial H.I.'s
Number of Accidents	1.00	acc/yr	25	X	0.164	=	4.10
Accident Rate	9.13	acc/MVE	98	X	0.225	=	22.05
Accident Severity	14,300	dollars	73	X	0.191	=	13.94
Volume/Capacity Ratio	0.11		29	X	0.082	=	2.38
Sight Distance Ratio	0.50	(wt.ave.)	100	X	0.074	=	7.40
Driver Expectancy	4.0	(wt.ave.)	67	X	0.149	=	9.98
Information System Deficiencies	3.0	(wt.ave.)	50	X	0.115	=	5.75

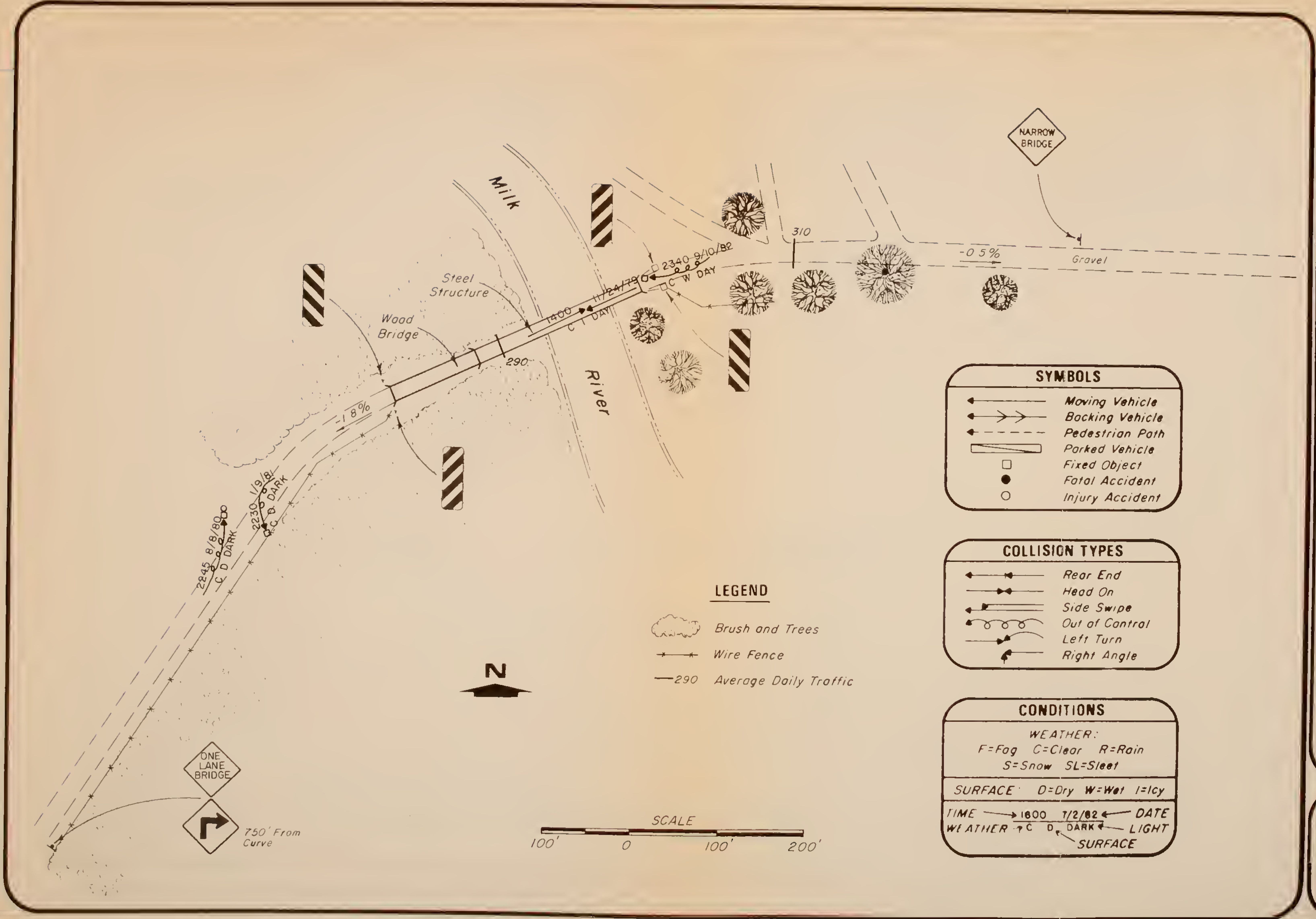
Hazard Index: 65.60

Cost of Recommended Improvements: $4,310

Cost Factor: 83

Priority Index = Hazard Index X .75 + Cost Factor X .25

49.20 X .75 + 20.75 X .25 = 69.95

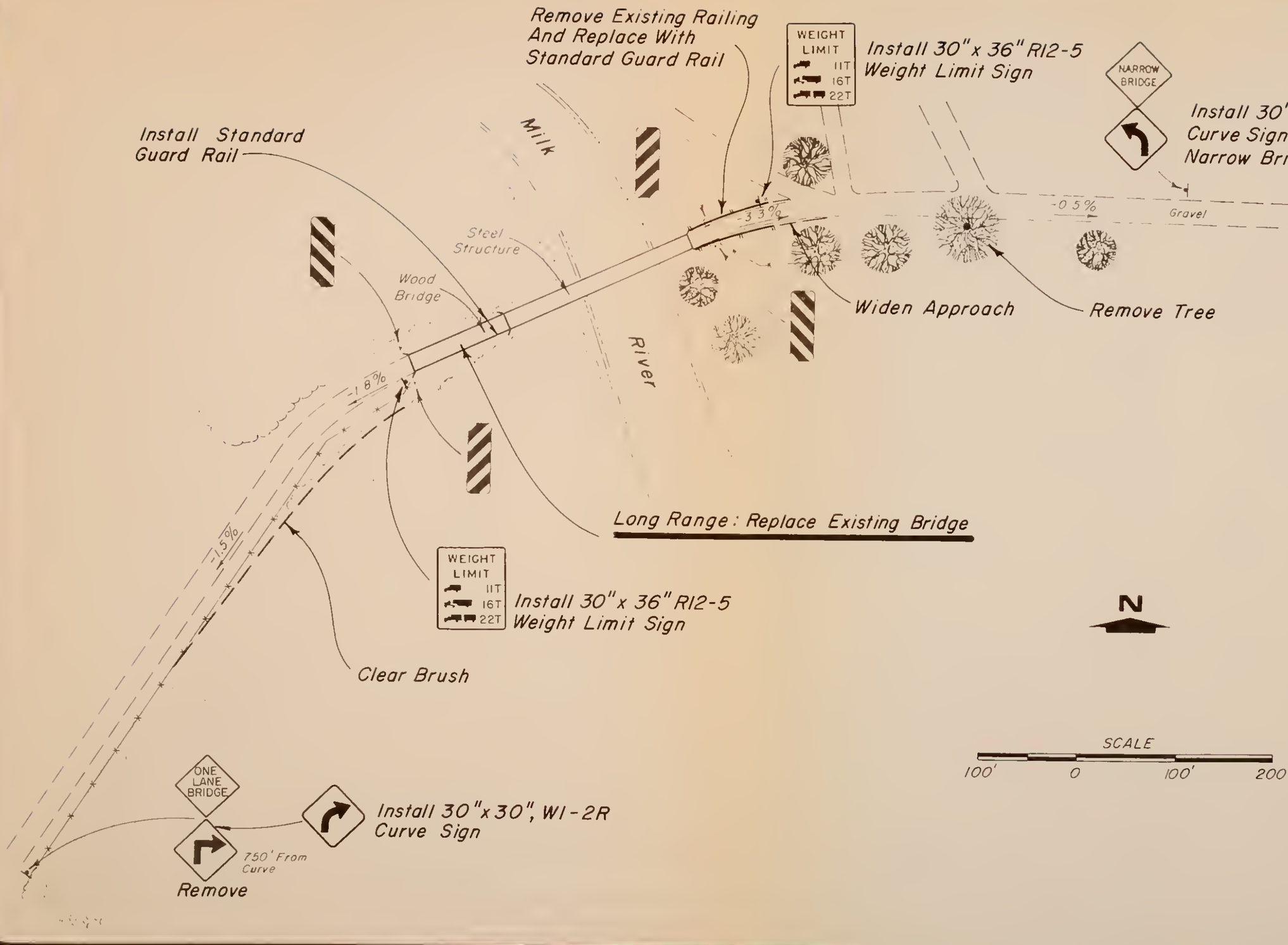


SITE NO. 5
Valley County

Existing Conditions & Accidents

6th Avenue Bridge - Glasgow

Fig. No. 5·1



Recommended Improvements

6th Avenue Bridge - Glasgow

SITE NO. 5

Valley County

Fig. No. 5-2

Site No. 6

SITE NO. 6 - COTTAGE ROAD · FORT PECK

West Approach

SITE #6

COTTAGE ROAD -- FORT PECK

A. Description

This site is located southwest of Fort Peck on the road that provides access to the leased homesite area on the north shore of Fort Peck Lake. The road also provides access to the Duck Creek Supper Club and adjacent stock car track.

The east approach to the site is paved to a point approximately 210 feet east of the approach to the landfill disposal site. The paved portion of the road is 30 feet in width. The gravel portion is 24 to 27 feet in width.

Traffic volumes have a high seasonal variation. The road provides access to 79 residential units that are occupied primarily during the summer months. Several are used as year around residences. Similarly, traffic generated by the Duck Creek Supper Club and the stock car track, is highly seasonal.

B. Accident Characteristics

Six accidents occurred at this site during the four-year period from 1979 through 1982.

The seasonal nature of travel on this road is evidenced by the fact that the accidents occurred from April through July, when road conditions were dry.

Three of the accidents were during the day and three during the hours of dusk or dark light conditions.

All of the accidents were the result of vehicles leaving the road. Speed was listed as a possible violation in five of the accidents.

The average age of drivers involved in accidents at the site was 21 years. Accident diagrams are shown on Figure 6-1 and a summary of accident characteristics is shown in Table 6-1.

C. Evaluation

The following factors pertinent to this site were determined from the field survey and accident analysis:

1. Primary accident occurrence is due to vehicles leaving the road because of excessive speed.

2. Due to the east-west orientation of the site, dark and dusk light conditions contribute to poor roadway visibility (see photo).

3. Gravel portion of road develops washboarding because of grades and high seasonal traffic volumes.

4. Recreation traffic to/from the areas served by the road has a high number of younger drivers which statewide statistics show, have a higher accident rate.

D. Recommendations

Short Range

1. Install delineators on both curves as shown.

2. Install two 48-inch X 24-inch, W-1-6 left large arrows on curves as shown.

3. Increase maintenance during summer months.

Long Range

1. Cut hill back as shown to improve sight distance and driver expectancy.

2. Extend pavement to top of hill on west approach.

E. Cost Estimate

Short Range

Item	Quantity	Unit	Unit Cost	Total Cost
Install delineators on both curves	39	ea.	$ 20	$ 780
Install 48"X24", W-6 large arrows	2	ea.	$210	$ 420
			Total cost	$1,200

Long Range

Item	Quantity	Unit	Unit Cost	Total Cost
Cut hill back to improve sight distance	850	c.y.	$4.00	$3,400
Extend pavement to top of hill	1,300 linear feet			N.A.*

The long range improvements do not appear to be feasible based on estimated traffic volumes. However, as traffic increased due to recreational travel of residents and not residents these improvements should be considered.

F. Hazard and Priority Indices

The hazard and priority indices are 63.00 and 71.00, respectively, for this site. The calculations are shown in Table 6-2.

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*There was not enough engineering information available to accurately estimate this cost.

ACCIDENT SUMMARY

Table 6-1

SITE NUMBER 6 ACCIDENT PERIOD 1979 - 1982

NUMBER OF ACCIDENTS BY YEAR

1979	1980	1981	1982
	1	4	1

NUMBER OF ACCIDENTS BY DAY OF WEEK

Sun.	Mon.	Teus.	Wed.	Thurs.	Fri.	Sat.
2				1	1	2

NUMBER OF ACCIDENTS BY MONTH

Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
			1		2	3					

NUMBER OF ACCIDENTS BY TIME OF DAY

-- AM --																							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1														2			1		1			1	

-- PM --

NUMBER OF ACCIDENTS BY LIGHT CONDITIONS

Day-light	Dark	Dawn	Dusk
3	2		1

NUMBER OF ACCIDENTS BY ROAD CONDITIONS

Dry	Wet	Snow	Ice	Other
6				

NUMBER OF ACCIDENTS BY WEATHER CONDITIONS

Clear	Rain	Snow	Fog
6			

NUMBER OF ACCIDENTS BY ACCIDENT TYPE

Angle	Turn	Rear End	Fixed Object	Ped.	Animal	Side-swipe	Non-Col	Head-on	Backing
			2				4		

NUMBER OF ACCIDENTS BY POSSIBLE VIOLATION

No Violat.	Drinking	Reckless Driving	Speed	Right-of-Way	Improper Passing	Improper Backing	Improper Turning	Other
			5					1

NUMBER OF ACCIDENTS BY SEVERITY

	1979	1980	1981	1982
Injury			2	1
Fatality				
Property Dam. Only		1	2	

NUMBER OF ACCIDENTS ALCOHOL INVOLVED

0

HAZARD INDEX CALCULATION

Table 6-2

Site Number 6 Date December 1983

Site Description Cottage Road -- Fort Peck

Indicator	Data Value		Indicator Value		Weight		Partial H.I.'s
Number of Accidents	1.50	acc/yr	28	X	0.164	=	4.59
Accident Rate	15.8	acc/MVE	100	X	0.225	=	22.50
Accident Severity	12400	dollars	69	X	0.191	=	13.18
Volume/Capacity Ratio	.08		26	X	0.082	=	2.13
Sight Distance Ratio	.50	(wt.ave.)	100	X	0.074	=	7.40
Driver Expectancy	3.0	(wt.ave.)	50	X	0.149	=	7.45
Information System Deficiencies	3.0	(wt.ave.)	50	X	0.115	=	5.75

Hazard Index: 63.00

Cost of Recommended Improvements: $1,140

Cost Factor: 95

Priority Index = Hazard Index X .75 + Cost Factor X .25

63.00 X .75 + 95 X .25 = 71.00

SITE NO. 6

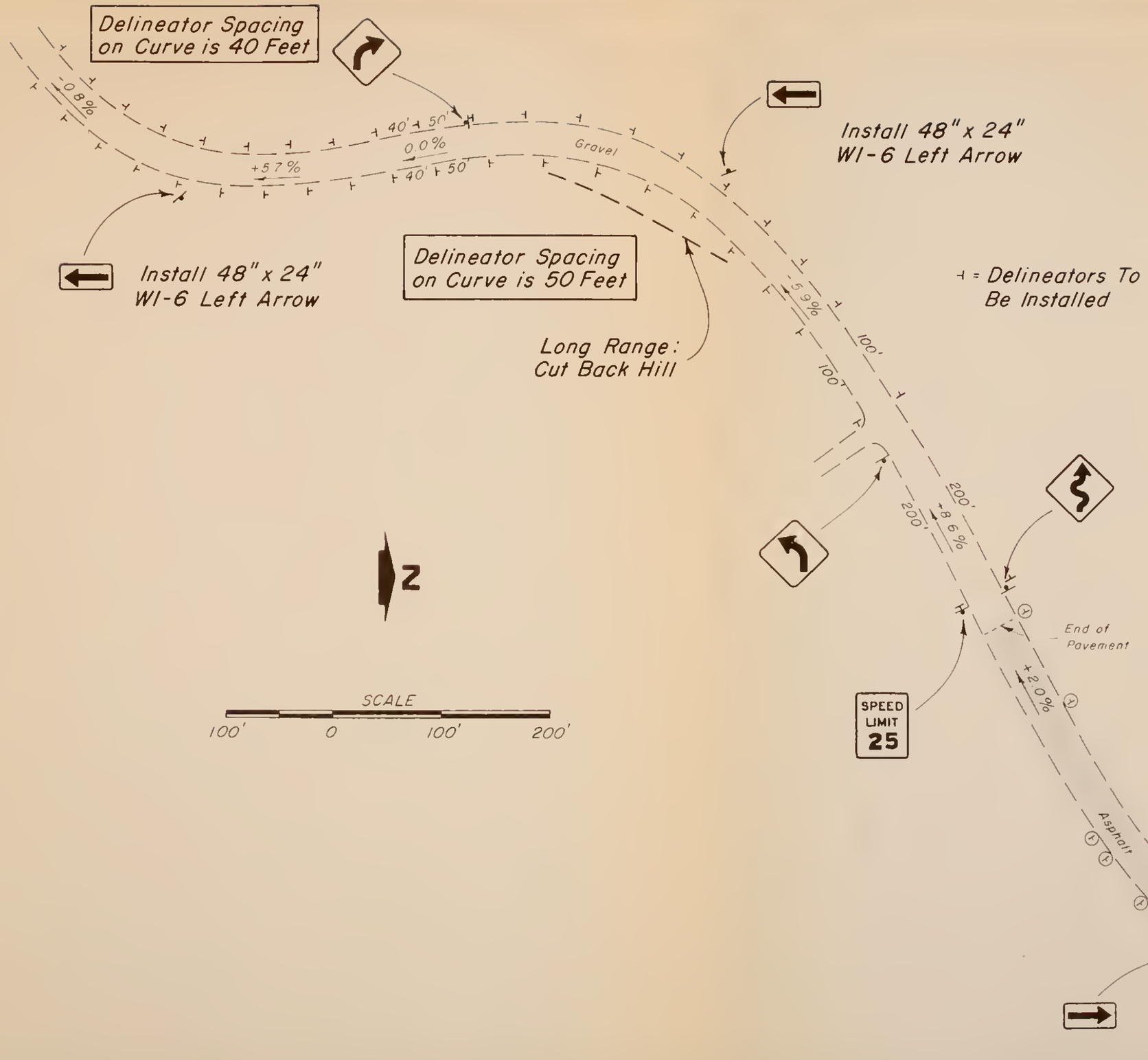
Existing Conditions & Accidents

Cottage Rood - Fort Peck

Valley County

Fig. No.

6-1



6 Recommended Improvements

Cottage Road - Fort Peck

SITE NO. 6

Valley County

Fig. No. 6-2